PC PILOT

The Magazine for Flight Simulation in association with www.simflight.com

CHOPPER WARS

Enemy Engaged takes on Gunship!

WHERE IN THE WORLD?

CHIPS WITH THAT, SIR?

The fastest processors fight it out

This inside:

ENGINES EXPLAINED

Find out what happens under the cowling

PLUS ALL

Janes F/A-18 • Private Wings • Crimson Skies • FS Design Studio • Final Approach • Jumbo Jet 2000 • Classic Airliners • and much more...

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05

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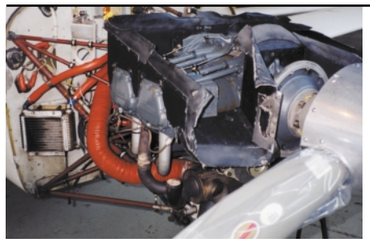
We've teamed up with simMarket.com to give you some great UK scenery for FS98, available free only to PC Pilot readers.



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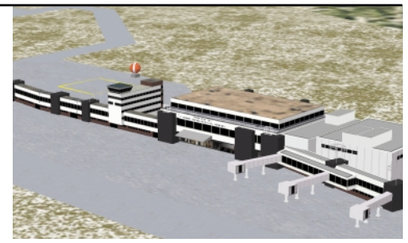

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Editor's Letter

Welcome to issue 5...

From a publisher's point of view, it must be extremely daunting to release an add-on product into the flight simulation market. Not only must they research whether the add-on will prove successful but also spend tens of thousands of pounds employing someone to develop it. Then it's a case of paying out many more thousands for packaging and marketing and hope that it sells enough to recoup the cost, or even (perish the thought), makes a profit. In most cases the commercial sector seems to succeed in this daunting task, but it would appear that there is a disturbing trend toward publishers re-releasing products in favour of newer versions with glossy new boxes and little or no improvements. We can see clear examples of this in our review of Classic Airliners (Page 34), preview of ProFlight 2000 (Page 13) and the '2K' release of Fly! in our News section.

So why is this happening? Could it be that publishers aren't making the money to invest in new products? Possible. Perhaps they cannot find the developers with the necessary skills to create them? Doubtful, because, as we point out in the review, there are thousands of developers around the world creating free add-ons in their spare time with as much technological know-how and tools as the professionals do.

It has been said that these 'freeware' developers are holding back the commercial sector. This is possible, as freeware 'products' outnumber commercial ones by immeasurable figures. You could debate that there is an unconscious rivalry being played out between the two. Because of this, publishers might not be willing to exploit the services of these people as they are seen as untamed competition.

Competition is a strong word, as freeware designers do not earn money for their creations and would surely jump at the chance of being compensated for one of their products or have it published. However, as you might know already or will soon discover in the reviews, freeware creations do appear to measure up to and in some instances overtake their boxed equivalents. Of course, it is worth pointing out that because freeware authors are not constrained by commercial requirements, they can afford to take greater risks and be more innovative with their creations.

We can only deduce that it's the publishers who aren't willing to open their minds to unexploited innovation or untested products. We can see clear illustrations of this time and time again with other game manufacturers, who concentrate on making improved and enhanced games based on the same breed of technology.

From a virtual pilot's point of view this could be an extremely disturbing trend. If the explanation above is anything to go by it would appear that the flight simulation market could be drying up at a time when it's only just getting motivated. We sincerely hope that publishers and developers start to heed these obvious warnings and take action immediately. So, what's the cure? Perhaps a good start would be to look at some fresh talent before the key developers head off to create more car racing games and raunchy action titles for Playstation 2.

If you have any views on this subject or would like to make a comment about anything you see in the magazine we would love to hear from you. Please write in to PC Pilot at the address below or e-mail us at mail@pcpilot.net with COMMS in the subject field, and we shall do our best to include it in a future issue.

Mike Clark
mike@pcpilot.net

The Crew

Mike Clark
Mike has been a journalist for 15 years with a background in PR and marketing. Mike became hooked on Flight Simulator in 1995 and in 1997 started work on a free e-mail flight simulation newsletter called TheMag. Since then TheMag has grown to a regular circulation of over 70,000! Mike has written many reviews and interviewed some of the biggest names in flight simulation and real aviation. Mike's style is to tell how it is and has made PC Pilot's mission to present, inform and advise readers on all computer flight simulation related issues.

Greg Gott
Greg has held a private pilot's licence for 11 years and enjoys cruising around the New England countryside in Skyhawks and Archers. Greg is a genius with hardware and knows many different types of system... being one of the first "overclockers". Some of his much-praised articles can be found at www.simflight.com.

Mike Hambly
Mike Hambly, retired Royal Air Force, veteran, is widely known for his freeware and and payware product sound sets. His interest in aviation began long before joining the Royal Air Force back in 1964. As a young man he used to frequent the airfield at RAF St. Mawgan to see the Shackletons and Neptune's of this very busy Coastal Command station. Mike also served in Germany, Cyprus, and Aden. He saw a great many changes in aircraft types from the days of the Vampire through to the Harrier and Nimrod. He began developing his own sounds for flight sim as a hobby now is recognised as one of the world's top sound designers.

Stephen Heyworth
Steve has been a qualified Pilot since 1984. He has flown many planes from the Piper and Cessna stables as well as more entertaining planes like the Tiger Moth, Chipmunk, Bulldog and Slingsby. He is licensed to fly by day, night and instruments. Steve has also written his own flight simulator using C++/DirectX and therefore has a good understanding of how flight simulators are programmed and work.

Joe Lavery
Joe has been a flight simulator enthusiast since the BBC Micro days and became interested enough to complete a Private Pilots course in 1996. He began his writing career covering mainly graphics and CAD reviews due to his background in this area but more recently has hosted a flight simulator column covering all aspects of simulated flight.

Bill Stack
Bill Stack has written numerous books and articles about business, management and marketing and has trained thousands of business and government professionals. With his flight simulation books, he applies his training background to help fellow flight simmers reach their greatest potential in flight skills.

Kenji Takeda
Kenji is an experienced computer journalist who has worked for such magazines as PC Gaming World, Computer Life and PC Review and is also a contributor to Gamespot UK. He holds a Master of Engineering degree in Aeronautics and Astronautics, a PhD in Aerodynamics and is a professional member of the American Institute of Aeronautics and Astronautics (www.aiaa.org). When he's not flying for PC Pilot, he is busy performing research in aeroacoustics, developing techniques to model aerodynamic noise and finding ways of reducing it to help make our airports quieter in the future.

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A COMMUNICATION FROM TOP BRASS

FROM: Air Chief Marshall Sir Michael Armitage

I am an ex-RAF pilot with over 4000 hours on all types from gliders to fast-jets (e.g. Jaguar). I have a fast computer (128Mb RAM etc) and would be grateful for some advice on the latest flight simulation programs. I already have Super EF2000, TAW and Falcon F4 installed, each of which has its own attractions. The problem with pre-radar era aircraft is that there is no realistic possibility of situational awareness. Meanwhile, the recent Flight Simulator items such as Combat FS and RAF 2000 look interesting, but exactly which would you advise me to purchase if I want the most realistic combat action?

We reply:

Firstly, thank you for your question. It's an honour to know that someone with your experience in aviation has decided to opt for PC Pilot Magazine. To answer your question (and that of a few others) in simple terms, Combat Flight Simulator is a stand-alone simulator that you can load and engage in combat with the aircraft supplied. We think it's pretty good value and achieves a high level of realism. Royal Air Force 2000 is an add-on which you can use either with Flight Simulator 2000 and simply fly the aircraft or add it to Combat Flight Simulator and gain new missions and aircraft that greatly expand the original product. The best advice we can give is try Combat Flight Simulator and if you like it there is always the option to upgrade it with the add-on. You could also consider Jane's F/A-18. This is a serious bit of kit that takes some learning, but one that will also be around for years to come.

COMMS

Betta Getta Proppa Beta?

FROM: Alan McNeal

Superlative magazine! In your item on video cards 'Battle of the Bulge' in Issue 4, you state that nVidia's drivers work faster than Creative Labs. I agree, that's my experience as well. However, you also state that the current reference build driver version for the Geforce Annihilator Pro was 3.77. The driver on the nVidia site is version 3.68 which has been available for several months. Where does 3.77 come from?

Greg Gott Replies:

Hello Alan, The 3.77 drivers are actually 'beta' drivers that we downloaded from www.reactorcritical.com Beta drivers are NOT supported by the manufacturer, but frequently offer improvements in both performance and graphics sharpness over the supported drivers. Being somewhat of an adventurous group of souls, we test nearly all the beta releases. At the time that review was being conducted, this was the most current bundle for nVidia TNT, TNT2, TNT2 Ultra, and GeForce cards. If you visit this site today however, you might notice there are actually several new beta driver builds beyond the 3.77s (5.13s at this time, which are superb). Remember, use at your own risk and always have the supported drivers close by in case you wish to revert.

Chopper Boys Wanted

FROM: Dan Morand

I found you through a link at Keith's Virtual Helipad: (www.members.aol.com/keith777/helipad.html) ....what a great resource you have going here! I currently fly for two VA's one of which is the 60th Helicopter Support Unit. It's a military style outfit that flies choppers in combat roles. Since we are always looking for dedicated helicopter pilots I was wondering if you might help us out with a very brief mention?

We reply:

Happy to pass on this information, Dan. Prospective helicopter pilots can check out the details in the section on Virtual Airlines over on page 60.

Zzzzzzoooooom!

From: Brian Jackson

Hi There! Just a question on the ZOOM mode in Flight Simulator 98. What setting do you suggest would be best for landing?

We reply:

Hi Brian. Microsoft intentionally retard the zoom setting by default to enable as much of an outside view as possible (something we have been telling them to change for around 9 years now). If you were to park on top of one of Flight Simulator 2000's refuelling bays or land on a helipad and then go into SPOT view, you will notice that you are actually between 1 and 3 lengths too short. To get the exact distance right and to also make accurately placed landings we suggest a zoom setting of 1.25 to 1.50 (depending on the aircraft you are flying). It takes a little getting used to and you will soon discover that you run out of runway pretty quickly. Still, it's accurate and a lot of fun!

Notonthenet.com

FROM: Peter Carragher

Thank you for my copy of Issue 4 of PC Pilot, it really is an excellent magazine and it covers all of the things that interest me. However, I feel that I must take you to task over one item on your editorial page, regarding the competition in Issue 3. I don't think the questions were too difficult or that we are too lazy to enter, the fact is the answers were only available on the Internet and not everybody is net connected.

We reply:

Sorry, Peter and anyone else who thought the answers were only on the Internet. It was possible to get them direct from CH Products, who tell us that a few adventurous souls did just that, but didn't exactly jam their switchboard. We're planning some exciting new competitions in future issues and we'll be sure to keep them open to readers who aren't on the Internet.

Never let it slip away!

FROM: Ray Erdinc

I just want to let you know how very, very pleased I am with my subscription of PC Pilot. Please do not let the format, quality and content slip, as some magazines do after a while (I know, I subscribe to around 6 mags per year).

We Reply:

Eric, thank you for your kind comments. We would like to assure you and all our readers that we constantly strive to improve the quality of the magazine that is written by PC Pilots for PC Pilots. We look forward to positive feedback but at the same time we thrive on negative feedback too, as it helps us to provide our readers with the best flight simulation magazine on the planet. Please keep your suggestions coming in. We also promise that we will continue to tell you 'how it really is'. This might upset a few deaf developers and publishers, but if we are honest – tough!

Woof!

FROM: Ian Hughes

I am a yearly subscriber to your magazine and just had to tell you that you are doing a great job, it's the dogs dangly bits! I am fairly new to flight simming, but thanks to you I am coming along a treat and have also joined my first VA which I found in your downloads section. Keep up the good work.

We reply:

Thanks PAL! Expect more downloads, more VA's and more unexpected features coming soon!

Exam time?

FROM: Steve Wisniewski

Evenin' all,

Not too long ago I stumbled across a site that lets you practice the whole FAA knowledge exam online, for free, as many times as you want! In fact, you sim Air Transport Pilots can even check how well you do on the real thing - it has the test for every single certificate and rating. Take a look at www.faa-test.com and select the 'practice written test' link on the left.

I found this site while looking for demo test-prep software and I'm sure glad I did, because I'm taking the real thing soon.

Have fun and good luck!

We reply:

Thanks Steve, happy to pass this on to all our transport flyers.

WHERE IN THE WORLD? - UK WORLD!

FROM: Paul Hollywood

I wondered if you know of any VFR quality UK scenery for Flight Simulator 2000 that's around, or in development ? Have you thought about publishing in your magazine interesting/challenging cross-country flights for us to try? Thanks again for a great mag, (not another advertising volume like so many other nameless publications kicking around!). Kind Regards to all 'The Crew'.

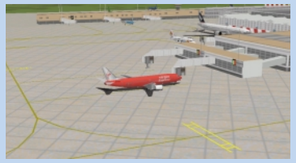
FROM: Reg Stokes

Can you tell me whether there is a good UK scenery disk available for Flight Simulator 2000? I have previously used Instant Access 'Perfect Flight Deluxe Great Britain' with Flight Simulator 98 but cannot load it into Flight Simulator 2000.

We Reply:

Thanks for all your e-mails and letters on this topic. The simple answer is that there are no commercial sceneries that cover the whole of the UK for use in Flight Simulator 2000. However, there are several different UK scenery projects in continuous development from varying developers and designers. The reason that most freeware and shareware scenery only covers certain areas is because Microsoft are now using mesh terrain scenery, which causes problems for scenery builders. Generally speaking, any FS98 scenery for any area of the world will not display correctly in FS2000 and that includes Perfect Flight Deluxe Great Britain. Watch this space – scenery design work takes a lot of time and effort and only now are the designers catching up with the new ways of manipulating the Microsoft scenery engine.

However, if you can't wait, check out the amazing offer on page 10 for a free download of Barry Perfect's English Airports for FS98.



Three of the airports from this exclusive free download.

COMING NEXT ISSUE.....

PC PILOT NUMBER 6 IS GOING TO BE A SCORCHER

As well as the rest of the free UK scenery download, we're giving away a bumper CD packed with freeware, shareware, patches and as a superb bonus, a surprise free product.

THERE'LL ALSO BE THE USUAL HEADY MIX OF THE BEST REVIEWS, FEATURES, TUTORIALS AND MUCH, MUCH MORE...

NEWS

Terminal Reality and 'G.O.D.' Release Fly! 2K – *Again!*

Just when you thought you had survived the 52Mb patch download and the headache of working out why the original Fly! didn't exactly get off the ground, there is now an updated version of Fly! available – again.

Fly! 2K's new features include Roger Wilco support, the SKY! Environment Exciter and the 172 Skyhawk Instrument Flight Rules (IFR) panel.

Roger Wilco is a real-time voice chat solution for online pilots, allowing players to engage in single or multiple conversations.

The SKY! Environment Exciter is claimed to produce hyper-realistic sun and clouds, detailed weather models including ready-made weather environments or custom weather settings, accurate night lighting and enhanced graphics for runways, taxiways and airport buildings. The 172 Skyhawk IFR instrument/cockpit panel allows simmers to fly in all weather conditions using the instruments rather than sight as the primary means of navigation.

Several additional enhancements complement Fly! 2K's new features. An expanded global elevation database allows for more precise elevation sample points to gain a realistic re-creation of real world topography. Improved avionics documentation provides a clearer understanding of Fly! 2K's virtually limitless functions. In addition, Fly! 2K also features improved product stability and additional Universal Serial Bus USB (Universal Serial Bus) support.

Customers can purchase Fly! 2K from the Gathering web site while registered users can update their current installation by sending back their original install CD along with a cheque or money order for $5 to Gathering of Developers who will dispatch an upgrade pack. ■

Publisher Developer: Terminal Reality/Gathering of Developers
Web: http://www.godgames.com
Price: $29.99 (PC)
Price: $29.99 (Mac) Pre-Order

NOTE: European publisher of Fly!, Take Two, have not confirmed a release date or even the eventual release of Fly! 2K. Shame!

HARDWARE DRIVER UPDATES

MATROX Millennium G400 MAX

Version Available: 31/3/00
http://matrox.com/mga/drivers/files/w9x_552.htm

3DFX Voodoo3 Drivers AGP/PCI

Windows NT drivers for 3Dfx Voodoo3 2000 or 3000 AGP/PCI-based graphics accelerator.
Version Available: 4/5/2000 :
http://updates.zdnet.com/products/pr_6233.htm

3DFX Voodoo2 3D Accelerator

Voodoo2 Drivers for Windows NT.
Version Available: 22/3/2000
http://updates.zdnet.com/products/pr_4471.htm

Diamond Multimedia Viper II Z200 Series Driver

NT 4.0 drivers for the Viper II Z200 graphics accelerator.
Version Available: 22/3/2000
http://updates.zdnet.com/products/pr_11649.htm

Diamond Viper II Z200 Bios Update

This BIOS update is compatible with the Viper II Z200.
Version Available: 22/3/2000
http://updates.zdnet.com/products/pr_11642.htm

Diamond Viper II Z200

Driver for both the Windows 98 and Windows 95 operating systems.
Version Available: 22/3/2000
http://updates.zdnet.com/products/pr_10992.htm

WILCO RELEASES Boeing 737 for Fly!

For armchair pilots itching to climb into the cockpit of a commercial aircraft, the next best thing to being there is the latest offering from Wilco Publishing - The new Boeing 737-500 Airliner for Fly! Due around the time of PC Pilot's release, the PC and Macintosh-compatible add-on will put Fly! fans at the controls of one of the workhorses of commercial aviation in a virtual environment said to be so real, you can practically feel the thrust levers.

Wilco's 737 will touchdown in 14 different liveries ranging from Delta and United to Air France, British Airways, Lufthansa and Sabena. The front, overhead, FMC, throttle quadrant and floor panels are faithfully reproduced 3D replicas that that are said to offer a more true-to-life perspective than conventional flat-view renderings and even deliver true 3D effects like shadows. ■

Release Date: Around Now
Publisher/Developer: Wilco Publishing/Terminal Reality
Web: http://www.wilcopub.com/
Price: $29.95/£24.95

For daily news updates log on to **www.simflight.com**

SOFTWARE UPDATES

FSTraffic - 1.05 Patch

WEB: http://www.fstraffic.com/downloads/FST_105PTH.zip

German Airports 3 Patch V2.0 for use with FS2000

WEB: http://home.t-online.de/home/Th-Hirsch/Gae-Main.htm

Flight Simulator 2000 Update for International Versions

WEB: http://www.microsoft.com/games/fs2000/default.asp

Jane's F/A-18 Patch

WEB: ftp://ftp.combatsim.com/C/ftppub/patches/jets/janesfa18/f18upd01.exe

Grand Canyon Patch for use with Flight Simulator 2000

WEB: ftp://ftp.wilcopub.com/pub/web102ef/GrandCanyonFS2000.exe

Flight Manager Patch 1.1a

WEB: http://www.simflight.com/share/fltmgr/fmpat11a.zip

FSUIPC.DLL v1.81

WEB: http://www.schiratti.com/files/dowson/fsuipc.zip

Flight Simulator 2000 MDL Repair for use with Windows 2000

WEB: http://www.simflight.com/files/MDLRepair.zip

Update to make Wilco's GPWS98 run on Flight Simulator 2000

WEB: http://www.flight-sim.iup.edu/files/uploads/gpws2000.zip

Flight Simulator 2000 Database for FSNav v3.0

WEB: http://www.flightsimmers.net/ddt/fs2kdt60.zip

FLIGHT MANAGER Version 1.1 released

Josef Dirnberger has released Version 1.1 of his Flight Manager Utility for Flight Simulator 98, 2000 and Combat Flight Simulator. Flight Manager Version 1.1 adds advanced weather capabilities and F9/F11 key based map toggling to the available functions of scenery viewing, plane tracking, chart building and flight planning. Weather charts for Flight Simulator 98 and 2000 are the main goodies. Charts are displayed on the Flight Manager map along with thunderstorms, winds and QNH. For more detailed information METAR style forecasts are only a mouse click away. What's more, Flight Manager will generate those missing winds aloft for Flight Simulator 2000 - including trade winds near the Equator - and fill up empty weather stations with reports from nearby. Registered users may download the resulting weather to Flight Simulator, finally planning and flying with winds above 1000 ft AGL. ■

Developer: Josef Dirnberger
Web: http://www.simflight.com/share/fltmgr/

STILL HAVEN'T FOUND WHAT YOU'RE LOOKING FOR?

The simFlight Network has recently announced the latest addition to its information resources. The FS Global Network is a new site designed to give the flight simulation enthusiast an easy interface to find exactly what he needs and fast! Split into many categories including Add-ons, FS Resources, Simulators, General Aviation, Hardware, Internet and Virtual Airlines, FS Global Network provides a huge directory of web sites to choose from and search through. ■

Web: http://www.fsglobal.net/
Contact: webmaster@fsglobal.net

Two new aids for Flight Simulator 2000 users from Microsoft

Microsoft are releasing a couple of useful improvements to Flight Simulator 2000, in the form of Checkrides and Local/Global Weather.

Just as in the real world, the checkrides in Flight Simulator are not designed to be an easy skate to the certificate. They require adherence to close tolerances, which are outlined in the briefings. (It's a good idea to print the briefing, which appears after you select a checkride and then click the check mark.) On the advanced checkrides, you're required to maintain your altitude within +/- 100 feet, heading within +/- 10 degrees, and airspeed within +/- 10 knots. The examiner adds to the difficulty by creating simulated instrument failures while you're flying in instrument conditions.

Flight Simulator 2000 includes an exciting and realistic weather model that makes your flying experience more challenging and fun. The Flight Simulator default weather scenario extends across the entire world and the default weather is what you see when you start the simulator. The new enhancement is said to be aimed at providing a more complete explanation of selections you can make in the Weather dialog box regarding the weather conditions you want to fly in. ■

Web: www.microsoft.com/games/fs2000/

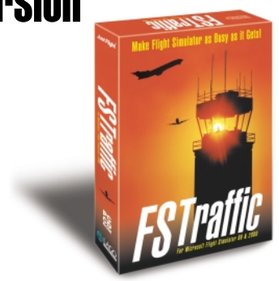
LIGHT AIRCRAFT SIMULATOR PRO V6.0

Digital Aviation is just about ready to release their latest version of Light Aircraft Simulator Pro - Version 6.0 with a highly specified and optimised software embedded 3D terrain and graphics rendering engine. This promises to deliver high quality 1km terrain visual scenery using only a standard Non-Accelerated Non-3D graphics card with 2Mb of graphics RAM. This new simulator has all of the original features and facilities of LAS-Pro Classic Edition... and more, but with photo realistic flight panels, and includes accurate geographic, environment and visual detail, with surface textured 1km terrain elevations. The built in 3D graphics software is optimised for better flight performance with 50nm visual scenery, using standard non 3D graphics cards, with Pentium 133Mhz. ■

Developer: Digital Aviation
Release Date: Out Now
Price: $69.99 ($44.99 with discount)
Web: http://www.digital-aviation.dial.pipex.com/

FS TRAFFIC
now in boxed version

FS Traffic hailed, as the add-on "designed by simmers for simmers" is now available on CD-ROM! This utility for Microsoft Flight Simulator 98 and 2000 allows you to record and playback traffic around any airport in the world, including ground movements. Voted as one of the most innovative products of 1999 by FlightSim.com, FS Traffic looks set to follow its shareware success and take the shops by storm. We have heard that it is already top of the ChartTrack statistics for flight simulation. ■



Publisher: Just Flight
Developer: Lago/simFlight
Web: http://www.justflight.com

AVIATION NEWS ON DISC

For those of you that like your aviation news on a CD-ROM, why not try the Digital Flight Mag. Produced bi-monthly on CD, it features the best from the world of aviation and flight simulation. ■

More details from Tony Woolcock at:
Web: www.powersims.mcmail.com
Tel: +44 02380 870584.

LAGO ANNOUNCES FSAssist!

FSAssist is said to be another really useful product that will help any user to get the maximum results from Flight Simulator 2000. Based on the Active Scenery technology FSAssist is expected to include:

- **FPS Enhancer:** A special module that reads the frame rate and sets the scenery density in Flight Simulator 2000 according to your preferences. If FPS (frames per second) goes below the value you set, the scenery complexity is automatically reduced - gaining FPS. If the FPS goes over the value you set, the scenery complexity is automatically increased. The FPS Enhancer module includes an audible feedback reminding ou that scenery settings are changed.
- **Overspeed Warning Call:** flying over 250kts below 10.000 ft, you will hear a voice warning you about the wrong configuration.
- **Pushback 2000:** this module will let you pushback the plane from the gate. Works on any airport, any aircraft.
- **Mark 7 2000:** this module will give you warnings when the aircraft is not in a safe configuration.
- **MDTraffic 2000:** shows up to five planes around your plane when you cruise. Picks up where FSTraffic stops.
- **FSWheel:** take full advantage of your mouse wheel in Flight Simulator 2000! Using the mouse wheel it is now possible to set the external view magnification factor and also change radio frequencies in a quick way and without the need of the keyboard. No more precise clicking with a mouse: Very convenient, very fast!
- **Scenery Complexity Setting:** two new shortcuts allow to quickly set the next or previous scenery complexity level without having to go three levels down into the Flight Simulator 2000 menu.

FSAssist will initially be offered on the Internet as a shareware (try before you buy) product. ■

Developer/Publisher: Lago snc
Web: www.lagoonline.com
Price: Not Available
Release Date: June 2000

PHOENIX SIMULATION SOFTWARE
Commercial software at Shareware Prices!

Phoenix Simulation Software has opened an online store to bring you the latest in Flight Simulator 2000 specific aircraft at what they say are "shareware prices".

The store will have their latest works available for download using all the latest technology to bring you detailed replicas of real world aircraft. Each one featuring full moving parts, internal modelling, Flight Simulator 2000 specific air files, super enhanced 512x512 textures, full night lighting effects (including reflected light!) as well as real 3D flight crews.

Each aircraft also has its own highly detailed panel, complete with all new custom gauges and night lighting. 3D rendered cockpit views are also included. ■

Web: www.pss-ltd.com

FARNBOROUGH 2000

Having checked all the latest aircraft downloads for flight sims, why not find out what the "other" side of the industry is up to at the Farnborough Air Show. The show is on between 24th and 30th July, with public days on Saturday 29th and Sunday 30th. For more information check out their web site at www.farnborough.com. Tickets for public days are £15.00 for adults in advance and can be obtained from the Ticketmaster hotline on 0870 843 2000 or alternatively, £20.00 on the day. PC Pilot staff will be lurking with intent to provide you with any useful information in Issue 6. ■

Just Flight TAKES OFF

The Associates, who claim to be the world's favourite dedicated flight simulation publisher, has announced a dramatic change to its name and trading style.

As of May 1st, 2000 The Associates will trade under the name 'Just Flight'. Reflecting this change, the registered name of the company is now Just Flight Limited and an all-new website – www.justflight.com - is already live and kicking.

Managing Director, Mungo Amyatt-Leir explains, "Over the past four years The Associates has experienced 100% growth year on year – with our business entirely focused on serious flight simulation.

"We have built up a reputation for near-total dominance of the flight sim add-on market in Europe. However, during the past year, we have also moved into publishing our own standalone simulations and more serious real-life aviation training products. These have been met with critical acclaim and sales success and broadened our reach to the millions of aviation enthusiasts further.

"Additionally, we now have much more of a worldwide presence, with offices in the UK, America and Germany. The new name and website reflects this more effectively."

The partial purchase of Atlanta-based Flight One Software at the end of last year has given the company very valuable development expertise and a useful boost to its US profile. Just Flight now has the ability to develop both add-on and standalone aviation products and sell them directly to retailers almost anywhere on the globe, making Just Flight much more than an old-school software publisher.

Mungo goes on to say, "We are moving much towards being a media company that specialises in aviation. We already provide valuable content on CD-ROM, on print and also over the web. This year we will be launching DVD titles and expanding our online presence with some tremendously exciting developments.

"Aviation attracts millions of very affluent, loyal and enthusiastic customers. We seem to be the only publisher who really takes the effort to understand them and can deliver the products they want – be it an official RAF add-on pack or complex instrument training simulation. Just Flight reflects much more accurately who we are. It is set to become a powerful force in the coming months." ■

Web: www.justflight.com

PC PILOT SPECIAL

FREE! English Airports for Flight Simulator 98

SimMarket.com's ShareCenter and Barry Perfect have teamed up to kindly offer PC Pilot readers a unique download of the popular shareware package called 'English Airports'. Normally, for the six airports in this collection you would pay $19.95. However, in a special offer to PC Pilot readers, three airports can be obtained free with this issue and the other three with our next issue.

This exclusive installation for Flight Simulator 98 contains Stansted, Birmingham and Manchester and has been developed by one of the UK's most respected flight simulation developers. Heathrow, Gatwick and Luton will be available free with Issue 6 of PC Pilot.

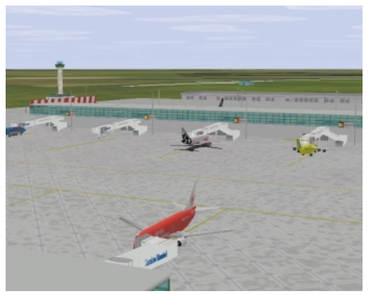
You can obtain this special download by visiting http://www.simmarket.com/freeoffer/pcp5 and entering this special code into the security popup: **5035063001324**. You will also be asked to provide a special word found in this issue of PC Pilot, so make sure you have your copy handy before going online.

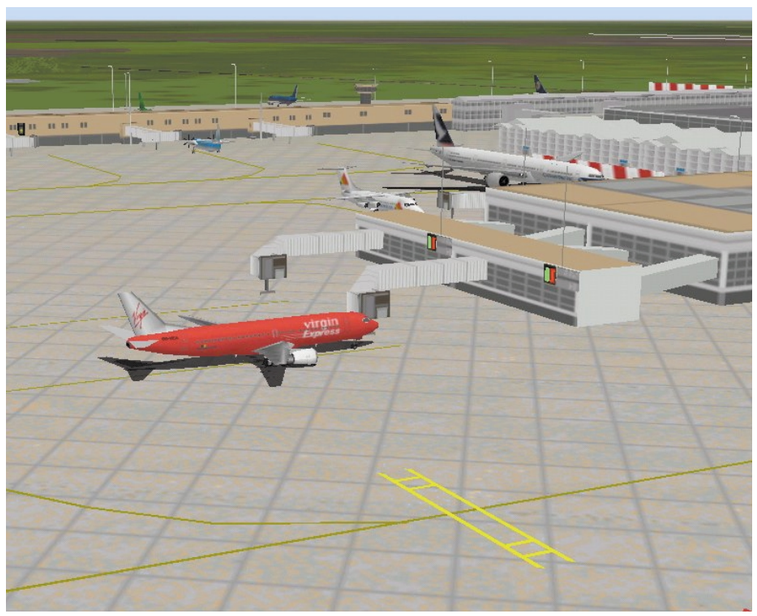
NOTE: Before you ask, no, this download will NOT work in Flight Simulator 2000. It is for Flight Simulator 98 only!

OTHER SHAREWARE TITLES AT SIMMARKET ARE:

ADVENTURE IDE	FS2000	FS98	
VOICE MASTER PRO	FS2000	FS98	
AD2000, AIRCRAFT DESIGNER 2000	FS2000	FS98	CFS
FS METEO, MARC PHILIBERT	FS2000	FS98	
WETTER2000, KLAUS PRICHATZ	FS2000	FS98	
FLIGHTSIM COMMANDER, Sascha Felix	FS2000		
SIMVOICE, Kirby W. Angell	FS2000		
FLIGHT MANAGER, JOSEF DIRNBERGER		FS98	CFS
FINAL APPROACH V6.40 GEORGES LORSCHE	FS2000	FLY!	CFS
JET OPERATOR 99, GERT HEIJNIS		FS98	
THE CONCORDE EXPERIENCE, PAUL DELANEY	FS2000	FS98	
BLUESKY, IAN MURRY		FS98	
MOVING MAP V3, JOHN HNIDEC		FS98	
FSPLANNER V4.0, SASCHA FELIX	FS2000	FS98	

www.simflight.com/share





The MAGIC of Flight Sim

As Founder of The VIP Group, Kenneth J Kerr has corresponded with thousands of fellow flight simmers over the last five years. It's always amazed him that many hold real Pilots Licences, yet seem just as happy flying their computer as they are in the left seat of a real aircraft. Why is that? He calls the answer "the Magic of Flight Sim" and he'd like to share a few thoughts about it.

Reality without Risk

When we fly a flight simulation, we become so involved that our subconscious believes that we are actually flying a real aircraft. That's why a difficult ILS approach in a simulation can bring us out in a sweat, or a great landing can make us grin from ear to ear! Regardless of how the technology advances, the illusion takes place in our mind, the technology merely presents better visual cues with each new generation of software, with the result that the simulated experience of flight becomes our reality, a reality without risk.

In contrast, there is a certain 'risk' involved every time we take to the sky as a pilot. Don't believe it? Try telling your life-insurance company that you're taking flying lessons and see what happens to your premiums! Our willingness to accept this risk can change at different times in life. For instance, we may think nothing of it when we're young, carefree and single, but what happens if you're a dad walking out the door for your first solo flight and your four-year-old says "be careful Daddy"? Responsibility hits home, hard! A lot of people stop flying for real when the kids come along, but they keep on flying flight simulators and are grateful that programmes exist to give them the 'reality' of flying, without the 'risk.' It's all part of 'The Magic of Flight Sim!'

Fun without Finances

Another factor is the cost of flying. Once again, you might be able to afford it when you're young and single... but, when marriage, kids, mortgage, car payment, two dogs and a budgie come along, it's a different story for many thousands of private pilots the world over. And guess what? The call of the sky never silences! You can be a decade away from your last flight as 'pilot in command' and still feel a stirring in your soul when an aircraft flies over. What are you going to do?

The call of the sky never silences!

That's where flight simulation comes in. For less than the price of a night out you can take to the air again! Spend a bit of money on add-ons and the world becomes your oyster. You can experience a whole virtual aviation career in the privacy of your home and still make your mortgage payments! Of course, you won't get credit for it towards a real licence (although I believe that will come some day), but because it feels so real you'll have much of the fun and satisfaction of doing it in real life. What's more, you'll believe you're doing it, and you won't break the bank in the process. Another part of 'The Magic of Flight Sim!'

Adventure without Aggravation

Another down side to real flying, which has caused many aviators to fall by the wayside, is aggravation! Ever had a lesson cancelled because of unserviceable aircraft? Or wasted thirty-five minutes of a sixty-minute booking just waiting in the line to get to the runway? How do you feel when a thunderstorm keeps you grounded far from home on a cross-country? You see, for all the adventure of flying, there's a certain amount of aggravation which can take the edge off it for many pilots!

OK... now jump into your flight simulator. The aircraft works fine, there's a clear taxiway ahead and you control the weather! You have no paperwork to fill in, no long pre-flight inspection and if you have to answer a 'call of nature' in the middle of the flight, you just hit the 'P' key. Yes, it's the adventure without the aggravation that's yet another small piece of the jigsaw which makes up 'The Magic of Flight Sim!'

So remember these thoughts next time you fire up your simulated aircraft and take to the computer-generated skies. Enjoy the reality, the fun and the adventure, and be grateful for the removal of risk, the absence of aggravation and the freedom from finances which we all, so often, take for granted when we immerse ourselves in the 'Magic'... The Magic which truly lies within each one of us! ■

Kenneth J Kerr

Kenneth J Kerr can be contacted by e-mail at vipplane@echo-on.net

Find out more about The VIP Group at www.fly-vipgroup.com

Crimson Skies

The Sky's the Limit

Up goes a Zeppelin

Microsoft is not the most prolific purveyor of leisure software, so when they announce a new game the news is received with rather more interest than usual.

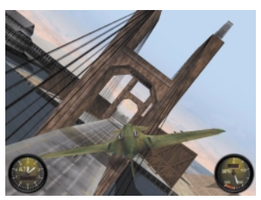
Designated as 'Crimson Skies', this is the latest project from the Zipper Interactive team in conjunction with Microsoft. It is said to reflect your childhood fantasies of what a real fighter pilot should be, with larger than life aircraft and equally imposing characters to pit your wits and skills against.

In case you hadn't guessed, this game is all about flying, not the type of flying you normally get in PC Pilot you understand, but more like the flying we used to do in the school playground (many years ago). Where aircraft could fly as fast as your imagination, were equipped with unlimited ammunition and everyone got to go home for tea. This is what 'Crimson Skies' is all about; it's a bit of fun. You don't have to file a flight plan, or worry about procedures, you simply climb aboard one of the twelve fantasy craft at your disposal and fly off into the sunset looking for adventure.

The game is set back in a fantasy USA of 1937 that is still suffering from the effects of the Great Depression and Prohibition. The imaginary politics of the time has created an opportunity for the strong to dominate the weak and bands of air pirates rule the skies. You play the role of Nathan Zachary, (honestly that's his name...) the notorious air buccaneer and ladies man. His sole purpose in life is to defend the weak, fly bravely and perish in a blaze of glory. This fairly sad existence is punctuated with plenty of swashbuckling missions, from treasure hunting off the coast of Hawaii, to dog fighting over the streets of what was once New York. You get to meet lots of villains along the way, challenge other ace pilots and, if you're lucky, get embroiled with one of the femme fatales looking to find some action of her own.

The game has a decidedly Flash Gordon look and feel to it, probably due to the time period it's set in, coupled with the tongue in cheek storyline. Nevertheless, if you're looking for some instant action and want to fly aircraft that shall we say, challenge the imagination, then this is going to be just up your street. If the gameplay lives up to the video clips we've seen, it should also be worth the wait. ■

Joe Lavery


Duck... this could be close!

There are some spectacular backdrops

What a target

Let's get him before he reaches the tunnel

PREVIEW

Publisher:	Microsoft	**Price:**	TBA
Website:	www.microsoft.com	**Expected Release Date:**	Autumn 2000
Developers:	Zipper Interactive Inc.		

The cast of characters

Our Hero - the notorious Nathan Zachary

Khan with two...er...friends

Pinup Charlie in sombre mood

Don't point that thing at me!

Salawa contemplating love, life and the universe.

Look at the size of those guns!

Speaking of Adventures!

Air Traffic Control has its benefits - Radar Contact v2 & ProFlight 2000 head-to-head

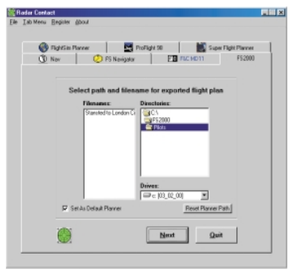
If you weren't already aware, we're sure that after reading five issues of PC Pilot you are now getting a pretty good idea of how realistic and thrilling flight simulation can be. You might be frustrated because you would like your flying experience to be even more realistic, but you aren't sure where to go to get that bit extra. Never fear, there are plenty of options open to you and we at PC Pilot have many ideas for you to consider. For example, have you considered adding realistic ATC (Air Traffic Control)?

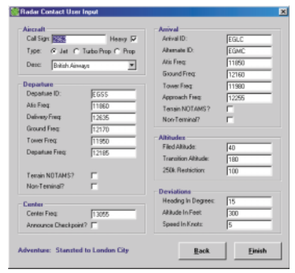
Soon, PC Pilot will be reviewing two well-known expansions designed to add Air Traffic Control to Microsoft's Flight Simulator 2000. We say "well known" because both these products have been around for some time. We are referring to the commercial product by AETI called Proflight 98 and JDT LLC's shareware (try before you buy) program called Radar Contact 98. These products at time of going to press were just about to hit the shelves in the shops and the Internet as updated versions for Flight Simulator 2000.

Firstly, ProFlight 2000 by AETI is a complete expansion for Flight Simulator 2000. It is designed to generate spoken ATC VFR (Visual Flight Rules) and IFR (Instrument Flight Rules) 'adventures' that include changing weather effects. You take your flight along a pre-planned route that can be patched through to an FMC (Flight Management Computer) and flown automatically. The generic FMC is built into updated Flight Simulator 2000 panels and aircraft that are enhanced by the product on installation. The spoken adventures and weather effects created by ProFlight 2000 are generated based on information you input to the program and incorporate many different variables such as differing regional accents for controllers or background chatter. The flight plans can be printed and saved for later use.

The original ProFlight 98 was an excellent addition to Flight Simulator 98 but lacked some details that virtual pilots wanted from simulated ATC. For example, the controllers would always say the same thing and there were no pushback requests, ATIS (Automatic Terminal Information Service) broadcasts or requests to hold because of delays. Even though there was the ability to add on extra voices and modules such as GPWS (Ground Proximity Warning System) downloaded from the Internet, ProFlight 98, although one of the best add-ons for Flight Simulator 98 seemed to suffer from a lower degree of realism. However, it was and still is excellent value for money and a solid ATC add-on for Flight Simulator 98. Lets hope that the 2000 version will be even better. However, there is a tiger waiting in the wings that has ghosted ProFlight 98 for over a year now that is also due for an updated release soon.

Just at the time when people started realising the down side of Proflight 98, Radar Contact 98, a shareware (try before you buy) product was released for $28.00 by two gentlemen from the USA. John Dekker, a systems analyst and Doug Thompson an air traffic controller from Memphis decided to take AETI's effort head on by introducing a product that would address the features not included in ProFlight 98.

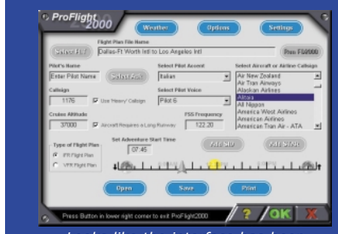

A simple interface proposes an easy program to navigate through. Notice the different flight plans you can use with Radar Contact v2

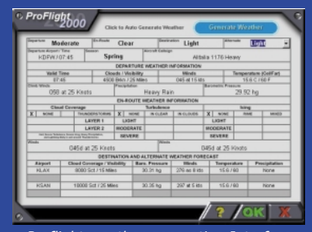

Quick selections and a final click make for a complex and extremely detailed flight. Are you pilot enough?

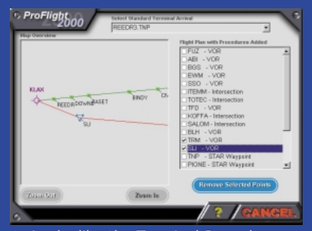
The Radar Contact team turned their attention to adding extra real ATC procedures and strictly adhering to the USA 7110.65 FAA (Federal Aircraft Administration) rules. Push backs, holding patterns, delays, low fuel warnings, en route controller changes and diversions were all aspects that Radar Contact provided to satisfy ATC hungry and demanding pilots. However, the program did not include a flight planner, weather generator, FMS (Flight Management System) or enhanced panels. To be able to generate your adventures you needed to first purchase or download a freeware flight planner to create a plan that was then imported into Radar Contact. This flight plan was then converted into adventure file (*.adv) after altering the various elements in the Radar Contact interface. We are glad to hear that this problem has been addressed in the next release (v2) with the inclusion of three freeware flight planners and a demonstration version of Flight Simulator Meteo, the popular shareware weather generator.

We look forward to testing these two new products next issue. We hear that Lago will also be bringing out an Air Traffic Control package soon, called ATC 2000. It will be interesting to see how all these products fair in our rigorous testing labs. ■

Mike Clark


Looks like the interface has been completely re-engineered


Proflight weather generation Interface looks strangely familiar.. In fact, it hardly looks any different from the original apart from the border.


Looks like the Terminal Procedures have had a face lift too. But do they cater for us UK pilots?

PREVIEW

Title:	Radar Contact	**Price:**	$30.00
Website:	www.flightsimmers.net/radarcontact/	**Release Date:**	Out Now!
Developers:	JDT LLC		
Title:	ProFlight 2000	**Price:**	£34.99
Website	www.simpilot.com		
Publisher/Developers:	AETI	**Release Date:**	July 2000

747 Jumbo Jet 2000 v3

747 "Heavy"

Data Becker are about to release Jumbo Jet 2000 Version 3, which is an update of their add-on package for Microsoft's Flight Simulator, dedicated to the Boeing 747 and all its derivatives. The update is said to bring the product in line with Flight Simulator 2000, including reworked textures, control panels and more detail in the models themselves. The first version was developed in conjunction with Andreas Herbst, an experienced Lufthansa pilot and released in 1997, complete with 10 different 747 variants and two highly detailed airports to fly from.

The new package we've seen has yet to be fully tested but should be pretty close to the final published version. There's no doubt that Jumbo Jet has been updated, but unfortunately what we've seen so far is not exactly inspiring. The fuselage for each model is constructed from either 10 or 12 sided polygons, the undercarriage rests on a single strut without any further detail and the cockpit windows are completely opaque. It seems that the commercial companies are lagging far behind the enthusiasts in this area, where recent freeware 747's display transparent cockpits,

Northwest on the pad - a few straight edges here!

A 747-400 in Boeing colours

A Nippon Cargo 747-200

fully detailed undercarriage and fuselages constructed from up to 32 sided polygons. This makes for a much cleaner looking model, with details that appear realistic. If you're going to re-release a product it has to be a worthwhile update, otherwise customers feel let down and the update should definitely be better than the freeware products available on the Net, (see Classic Airlines review also in this issue).

This time around there are 26 different aircraft incorporating the 747-100, 200, 200F, 300, 400, 747 SP and three examples of the 767-300 in various airline colours but no new scenery. The biggest improvement has been made inside the cockpit, where the latest 400 series features the MFD (Multi-Function Display) units that are becoming more common in modern airliners. Also included is a fully functional Flight Director and the latest EICAS (Engine Indicating and Crew Alerting System). All the aircraft now support the Flight Simulator 2000 GPS (Global Positioning System) instrument, which sports its own button on the bulkhead.

The bitmaps used for the latest panel backdrops are well designed and functionally correct, incorporating an overhead flight control panel with engine management system and fully functioning switches. Because this is the focal point of your simulated flying, the quality of the internals more than makes up for the lack of external detail. We hope that when the final version is released the packaging and manuals make up for the shortcomings we found in the preview. ■

Joe Lavery

Compare the chunky Data Becker Jumbo with free versions on the right

Custom paintjob on this freeware cargo carrying 747

Notice the smooth lines, clear cockpit and enhanced detail on this freeware 747

Another nicely constructed freeware 747

PREVIEW

Publisher:	Data Becker UK	**Price:**	£14.99
Website:	www.databecker.co.uk	**Expected Release Date:**	June 2000
Developers:	Data Becker		

UNDER THE COWLING

Light Aircraft Engines

When someone takes his or her first flight in a light aircraft, there is almost always one question that gets asked: "what happens if the engine stops?" This is a pretty reasonable thing to verify if you are about to trust your life to an aeroplane with only one engine. Fortunately, although a healthy concern for the failure of anything to do with your flight is eminently sensible, failure of aero-engines is rare. A modern aero-engine will typically fly a service life of 2,000 hours without missing a single beat.

The internal combustion engines used in aircraft are pretty much the same as those in cars, however they do differ in some significant ways. This is primarily because they have been developed with different priorities in mind. If a modern car engine fails the effect is usually embarrassment, whereas failure of an aero-engine instantly causes a serious emergency. Understandably, absolute reliability appears pretty much at the top of the shopping list when aero-engines are bought.

"what happens if the engine stops?"

The engines found in most production light aircraft have a similar overall design, and a typical manufacturer would be Textron Lycoming. They make engines that range from a small 100 HP 4 cylinder 235 cu in 3.8 litre types through to a 400 HP 8 cylinder 720 cu in 11.7 litre powerhouse. If you look at the photographs you will see two cylinders on the left hand side of the engine, each with two grey pushrod tubes, air cooling fins and a rocker cover on its end. There are two more cylinders on the opposite side of the engine and this layout of engine is called 'horizontally opposed'. The crankshaft runs down the middle of the engine and the propeller assembly is bolted directly onto the end. Figure 2 shows a bare engine without the propeller connected and with the end of the crankshaft protected by polyethylene.

So what makes these engines so reliable? First of all they are big, slow running engines. Propellers are best at rotational speeds up to about 2,700 RPM (revolutions per minute). This keeps the stresses relatively low throughout the engine, including any out of balance forces and gyroscopic forces. At higher rotational speeds the tips of the propellers will ultimately go supersonic, so there is not much point in revving faster anyway.

Ignition and fuel

Next come the ignition systems, which generate the sparks to ignite the fuel and air in the cylinders. There are two completely independent ignition systems, which don't even rely on the aircraft's battery to provide the spark. Each system has its own magneto, distributor and spark plugs. If you look closely at the engine in Figure 2, you will see the top spark plugs on the port cylinders and the bottom ones on the starboard cylinders. This all means that so long as the engine is turning, each cylinder should be getting two sparks. If one ignition system fails, the other will keep the plane flying with very little reduction in power.

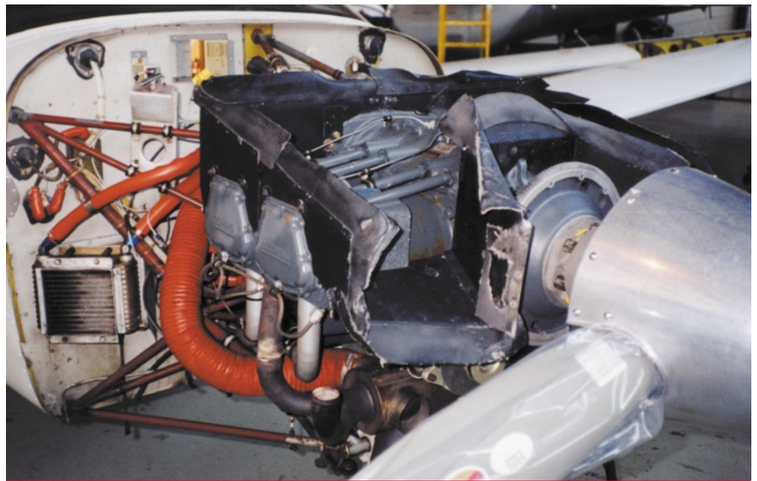


Figure 1: Typical aero-engine from a single-engined touring aircraft

To get combustion, it is essential to have fuel, oxygen and a source of ignition. We have two sources of ignition, but how do the fuel and air get to the engine? The fuel, or 'avgas', which is most commonly a blue coloured 100-octane low lead fuel, is normally held in the wings or fuselage. For some high winged planes such as the smaller Cessna aircraft, the fuel falls by gravity through a filter to the engine. Most planes, however, need to pump the fuel to get enough avgas into the engine and this is done by a mechanical fuel pump that is gear driven by the engine. There is almost always an additional electrical boost pump, which acts as a backup to the mechanical pump. It is often needed for starting and flying at high altitudes and is also used at critical times, such as take off and landing, when changing tanks or when the normal pump fails.

Aircraft that are used for serious aerobatics need to have systems that can deliver fuel to the engine when the plane is in every conceivable attitude, including upside down. This is because when a plane is pulling negative G, the fuel moves to the top of the fuel tank leaving the bottom of the tank dry. As this is where the fuel is normally taken from, the engine is starved of fuel. Some older aerobatic planes, such as the Chipmunk, do not have inverted fuel systems and the engine cuts out when flown upside down for more than a few seconds. Fortunately, the propeller windmills in the airflow and the engine restarts itself when the plane is rolled upright again.

Induction systems

Cold air, which is about 21% oxygen, is drawn into the engine via a filter that is often visible underneath the propeller. The air is mixed with the fuel either in a carburettor or by fuel injection and is then sent to the cylinders through the intake manifold system. Air at higher altitudes is less dense, or 'thinner', and while this means less drag and faster flight, it also means there is less oxygen to burn the fuel and hence less power. This is one of the key factors limiting the height at which a plane can sensibly fly, or its service ceiling. To overcome this, some engines have a supercharger or a turbocharger to boost the air pressure before it is put into the cylinders. This has two major advantages. Firstly, it can force more fuel/air mixture into the cylinders, effectively turning it into a bigger engine. Secondly it overcomes the effect of the air thinning at higher altitudes, allowing the engine to deliver its sea-level power at much greater height.

Figure 2: Flat four engine with propeller removed

The two biggest problems with the air induction system are ice and filter blockage, both of which will reduce the amount of air entering the engine. Less air means less fuel burnt and hence less power, but ice can also literally freeze the throttle in one position. As this combination can be caused by a long, low power descent, finding the throttle frozen when trying to level out is seriously bad news. Ice is most likely to occur where the fuel is entering the carburettor or on the throttle butterfly valve. To combat this ice there is normally a carburettor heat lever (carb-heat), which draws air from inside the engine cowling, bypassing the filter. The air then passes though a heater muff around the exhaust pipe and into the carburettor. As this air is warm, it will melt any ice there and hence it is a good idea to apply the carb-heat for 30 seconds every 10 minutes or so.

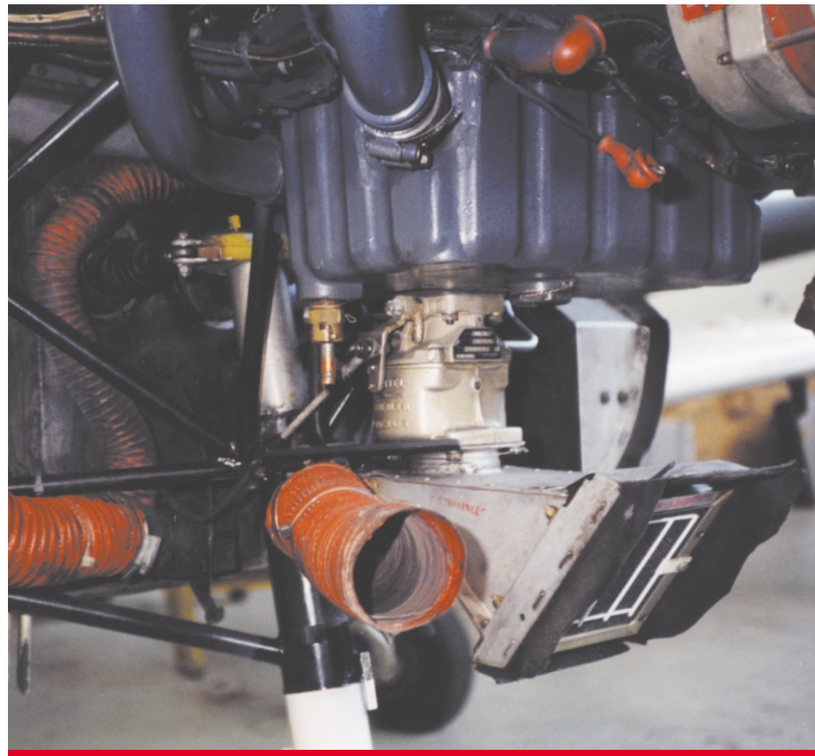


Figure 3: Air induction filter and carburettor

Filter blockage can be caused by dust and dirt, but is most likely to be a serious and sudden problem if it is caused by 'impact ice' when flying in icing conditions. If the filter is blocked, the pilot can select carb-heat to keep air flowing to the engine. A fuel injected engine has no carburettor and hence no carb-heat, but it does have a means of drawing air into the fuel injection unit from inside the engine cowling. This is called 'alternate air' and can either be automatic or controlled by the pilot.

Lubrication

Oil is pumped to the bearings and moving parts of the engine for two main reasons. Firstly, all these sliding or rubbing surfaces need to be lubricated to reduce or eliminate wear. Secondly, the oil performs a vital function in removing heat from the bearings and some other hot parts of the engine. In a basic system, the oil simply redistributes this heat to the whole engine. The engine itself is then cooled by the airflow over the crankcase and the cooling

fins on the outside of the cylinders. Where this natural heat removal it is not enough, the oil is pumped through an oil-cooling radiator.

In a basic engine, the oil is taken from the sump at the bottom of the crankcase, is pumped via a filter to the bearings and other parts of the engine, and then drains back to the sump again. More sophisticated planes have engines with 'dry sumps'. In this type of system a scavenge pump takes the oil from the engine sump and sends it to a separate tank, from where it is pumped onward to provide the engine lubrication. Dry sumps allow better control of the oil temperature and make inverted systems for aerobatic aircraft possible. The oil is genuinely the lifeblood of the engine and without proper lubrication it will rapidly die.

Propellers

A propeller is essentially a number of aerofoils attached to a hub assembly, and these aerofoils are angled in the same way as they are in a domestic fan. Because an aerofoil can only operate efficiently over a small range of angles of attack, this blade angle, or the 'pitch' of the propeller, has to be set for a given RPM and airspeed. The optimum blade angle even varies along the length of the propeller, which is why they are twisted. It all gets very, very complex, but in broad terms unless the propeller blade angle can be changed during flight, it will have to be a big compromise. This is just what is done for a standard fixed pitch propeller.

Fixed pitch propellers are the lowest cost both to buy and to maintain. They are also the easiest for the pilot to manage and hence they tend to be used on lower cost and training aircraft. Unfortunately, they are always a compromise because the pitch cannot be optimised for both take-off and cruising speeds. It's a bit like a car with only one gear. Usually the propeller pitch will be chosen to give acceptable performance during all phases of flight. When taking off, the engine will not be able to drive the propeller at its full RPM, hence it cannot develop its maximum power, and the take off distance will be longer. At the other end of the scale, the maximum cruise speed will not be as high as it could be.

A large proportion of this compromise can be removed by fitting aircraft with constant speed propellers, or variable pitch propellers. These allow the pilot to adjust the speed of the propeller and engine during flight. Once the engine is producing a reasonable amount of power, the CSU (constant speed unit) built into the hub will keep the RPM constant. This makes the propeller much more efficient over the whole airspeed and altitude envelope, and allows all the available engine power to be used at any time, including during takeoff.

Controls

Inside the cockpit, there are typically three main controls for the engine, throttle, mixture and propeller. They can be either levers or plungers and are often coded by colour and shape. Typically the throttle is black and smooth, the propeller control is blue with deep grooves and the mixture is red with angular ridges. It is pretty vital that these controls don't move once they are set in position, so there is usually a lever or bezel that sets the amount of friction in their movement.

Most flight simulator pilots are completely familiar with the throttle and in many cases it will be the only engine control that they use. Push it forward to put more air and fuel into the engine and thereby get more power or pull it back for the opposite effect. The use of the other controls may be less obvious.

Pulling back the mixture control, not surprisingly, reduces the proportion of fuel mixed with the air sent to the engine. Pulling it back all of the way will actually stop the engine by moving the mixture to 'idle cut off'. Why would you want to adjust the mixture? An aero-engine has to operate over a huge range of altitudes, temperature, humidity and throttle settings. It is doubtless possible nowadays to design a sophisticated control system to manage this, but it would be unjustifiably expensive for most planes and probably not as reliable as the simple linkages involved in the basic manual system. The propeller control is only installed when the plane has variable pitch propellers and it is used to set the governed RPM of the propeller CSU.

There are several other minor controls for an engine that are all vital in their own way, but they only tend to be used occasionally during a flight. It is often necessary to prime the engine with fuel to start it, especially when it is cold. For carburetted engines this is normally done using the 'primer', which is a small hand operated pump mounted at the bottom of the instrument panel. It looks like a small round metal plunger and is pulled out and pushed back in to prime the engine. Typically six strokes are used for a cold engine and nothing for a hot engine. The boost pump has a conveniently placed on/off switch and the carb-heat control is either a plunger or a small lever. The cooling of the engine can be managed on some aircraft by setting the position of cowl flaps, which are usually set open on the ground and closed in the air.

Figure 4: Engine instruments and controls

Instrumentation

The engine is such a critical part of an aeroplane that several instruments are used to set its performance and monitor its health. The objective of setting the engine performance is to get the desired power using the least fuel without compromising reliability. For a simple carburetted engine with fixed pitch propeller, the main performance instrument is the RPM gauge and it is used as a broad indicator of the power being produced. The pilot would typically select maximum throttle for take off or climb and 2200 to 2400 RPM for cruise. To get the mixture control set correctly, the aircraft may have an EGT (exhaust gas temperature gauge). This EGT peaks at the best economy mixture, but it is normally recommended to enrich the mixture again until the EGT drops by about 250°F. If there is no EGT gauge, the technique is to weaken the mixture until the engine starts sounding a little unhealthy and then push the lever back a tad. Not surprisingly, many pilots choose the option of leaving the mixture safely set to fully rich at all times.

Life is more complex, but in a way easier, when flying a plane with a constant speed propeller and a fuel injected engine. Three main instruments would be used to control this type of engine and they are the manifold pressure, fuel flow (or pressure) and engine RPM. These three are set at the desired reading by adjustment of the throttle, mixture and prop levers respectively. The settings depend on the required power and the pressure altitude flown, and are given in tables in the aircraft manuals. As an example, to cruise in a Bulldog with 70% power at 2000 feet, the settings could be 2400 RPM, 24 inches manifold pressure and 3.9 PSI fuel pressure. Matching the manifold pressure and RPM in this way (e.g. 2200 RPM and 22 inches) is referred to as being 'boxed' and is often used to give easily memorable engine settings. For take-off and initial climb, all three levers would normally be fully forward.

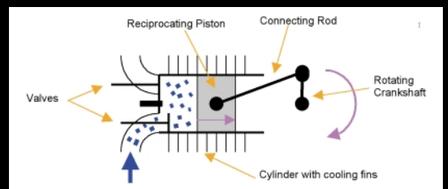
There are a number of ancillary instruments that are used to monitor the health of the engine and fuel system. The most common are oil pressure and temperature, cylinder head temperature, fuel tank contents, fuel supply pressure and EGT. Once an engine has warmed up, the temperatures and pressures should remain in the green sectors of their dials. As for the fuel tank contents gauge, it is advisable never to trust them as an exact indication of how much fuel you have left. Use them to cross check flight planning calculations and your visual inspection of the tanks before take off and only believe them if they read less than you were expecting. Many a pilot has been highly alarmed to find that fuel on the gauge is not necessarily fuel in the tank.

As flight simulators become more realistic, it will become more useful to understand the workings of the virtual engine. If you are already a pilot or decide to take the big step of learning to fly, a proper understanding of how the engine functions is essential. Engine management is a critical part of flying and the more you know about it, the better pilot you will be. ■

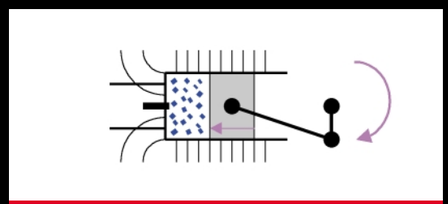
Stephen Heyworth

THE OTTO CYCLE – FOUR STROKE ENGINES

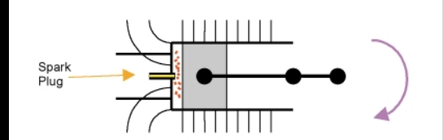
The method of converting fuel into power was first used successfully by the German engineer Dr N. A. Otto and was named 'Otto Cycle' after him. A mixture of fuel and air is sucked into each cylinder, compressed and then ignited by spark plugs. Burning the fuel in the cylinder results in a cylinder full of hot gas. This hot gas expands, forcing the piston down. The piston pushes on a connecting rod, which turns the crankshaft. The used gas is then blown out of the cylinder through the exhaust system.



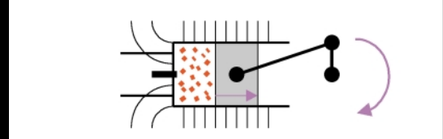
***Stroke 1** - Induction – air and fuel is taken into cylinder – inlet valve open*



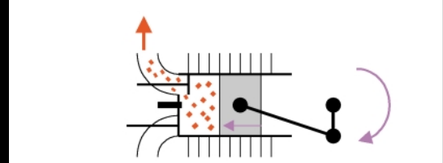
***Stroke 2** - Compression – air and fuel is compressed*



***Ignition** – The spark plug starts the fuel burning*



***Stroke 3** – Power – The hot gas pushes the piston down forcing the crankshaft and therefore the propeller round*



***Stroke 4** – Exhaust – The hot gases are pushed out of the cylinder – The exhaust valve is open*

Enemy Engaged:

RAH-66 Comanche versus KA-52 Hokum

Sleek lines keep the Comanche off the radar screens until it's too late for the enemy

The KA-52 Hokum. Solid Russian engineering at its finest

Two's company

Helicopter combat is a strange mix. More like being an infantry soldier on the ground than flying high at Mach One, it requires stealth and cunning to stay alive. In simulations, it is the cat-and-mouse nature of this type of warfare that has been hard to convey to the PC flyer. Perhaps this is due to the difficulties in rendering the low-level domain of the combat chopper. Indeed, the success of Razorwork's debut hit, Apache Havoc, was largely thanks to the terrain engine, which was developed specifically for this arena.

Enemy Engaged RAH-66 Comanche versus KA-52 Hokum (or Comanche Hokum, to give it's more common title that's less of a mouthful!) builds on the Apache Havoc engine and brings the US Army's remarkable 21st Century combat helicopter, the RAH-66 Comanche, to the PC. Unlike Novalogic's action-oriented Comanche series, this sim is aimed at the hardcore simulation fraternity, as well as novices. For those who prefer solid Russian engineering, the Hokum brings a healthy dose of destruction to any battlefield.

The vertical terrain is perfect for hide-and-seek

21st Century Boy

Welcome to the future. The RAH-66 Comanche brings stealth technology to rotorcraft regiments while packing a fiercer punch than the antagonistic Apache. Originally intended to replace the ageing Hueys, Cobras and Kiowas in the US Army's inventory under the LHX (Lightweight Helicopter Experimental) programme, the Department of Defense scaled down its requirement to only upgrade its scout and attack capabilities. Boeing Sikorsky took up the challenge, and the Comanche is due to enter operational testing next year, with full deployment set for 2006.

The angular profile of the Comanche belies its stealthy character. With swept blade tips, a bearingless main rotor and a low rpm 'whisper' mode, this chopper can sneak up and deliver its deadly punch with unerring accuracy. The avionics suite can automatically identify targets, share data over a 'tactical internet' and pull up a 3D terrain map for en route mission planning. This is a pilot's dream and makes the Apache look like a museum piece.

Features:

- Radar signature 1/300 of current aircraft
- Internal weapons bay for 6 Hellfire anti-tank missiles
- Capable of carrying 14 Hellfire under removable wings
- 2nd generation forward looking infra-red camera, able to see live power cables
- Triply-redundant fly-by-wire control system
- On-board computing equivalent to four supercomputers

Hokum Heroics

Features:

- Contra-rotating twin main rotors
- Zvezda K-37-800 pilot ejection system
- 300kg of steel armour to protect the crew
- Phazotron FH-01 Arbalat (Crossbow) Centimetre/millimetre wave radar
- 2 x 2500 shaft horsepower engines
- Under hull turret-mounted periscope

Stalwart of the Soviet services, the multi-purpose Mi-24 Hind is showing its age among the new upstarts. The Mi-28 Havoc and KA-50 Hokum both made the grade, with the latter being initially built as single-seater airframe. With advances in radar systems, the Hokum's avionics became increasingly complex and too much for a lone pilot. The two-seater training version became the KA-52, with side-by-side seating enabling close-coordination between the crew. Weighing in at twice as much as the Comanche, this beast is a lot more menacing too, with a 30mm cannon that looks like an artillery piece.

The most unique feature of the KA-52 is the contra-rotating main rotor configuration. A trademark of the Kamov Bureau, the lack of tail rotor and using two main rotors spinning in opposite directions increases performance by directing all of the engine power through the main shaft. In terms of handling, gunning the throttle does not whip the nose sideways, and flat turns are possible at high speeds making for a supremely agile flyer. What the Hokum lacks in high-tech sophistication it makes up for in solid engineering.

If you are itching to fly straight away, there is a Free Flight Combat Mode to give instant gratification. Taking the Comanche for a spin reveals its ultra-modern interior. The pilot and gunner sit in a tandem configuration and have identical cockpits full of green MFDs (Multi-Function Displays). The distinct lack of dials is strange at first, but the power and flexibility of the avionics suite soon becomes apparent. The helicopter is flyable from either seat, so it is useful to setup the pilot and gunner MFDs in different modes, and switch between them as necessary by just stabbing the Escape key.

Fly the friendly skies. There's always plenty of air support around

The lusciously thick manual provides a thorough grounding in how to use the multitude of systems, with both Easy and Hard modes to suit novices and veterans. The included colour keyboard map highlights the difference in complexity, with the latter mode using every available key, often two or three times over. That said, the actual number of keys needed at any particular time is easily manageable, especially with a good joystick/throttle setup. The beauty of the Comanche is that the systems are designed to reduce crew workload and it certainly is easier than the Apache. The excellent Heads-Up Display and wide-angle night vision capability also make missions a lot easier.

More TVs than a Dixons superstore in the Comanche

Owners of the earlier Apache Havoc are in for a treat. Now they can upgrade and get four choppers to choose from

Now you see it, now you don't. The transparent cockpit can make flying and shooting a whole lot easier

In contrast to the ergonomically exquisite Comanche cockpit is the Hokum office. This is actually not as out-of-date as one might expect, featuring four French-made MFDs with almost as much functionality as the Comanche. For the nervous, there is a comforting number of primary flight instrument dials in case the computers conk out. The most disturbing aspects of the Hokum are the animated crewmen. Turn on night vision and you can see your compatriot reach out and pull his goggles down. Once in a while you'll get a thumbs up, and you can even see your own feet and hands moving too. This all seems a bit over the top, but adds to the overall atmosphere and important immersion factor.

The level of detail in the virtual cockpits is particularly impressive as you scan for targets, or just enjoy the view. Panning around the cockpit with the joystick hat switch is smooth, and necessary for keeping tabs on your MFD information. Thankfully, these displays are surprisingly readable at higher (800 x 600+) resolutions. There are several padlock views, not just locking onto a target, but also your next waypoint or wingman.

The view outside the cockpit is every bit as good as inside. Rather than simply using digital elevation map data and satellite imagery, the terrain has been hand-tweaked to increase the detail. For example, rivers run along deep valleys, which make perfect hiding places. There are plenty of sheer cliffs, stone walls and forests to hide in and around. Trees are depicted both singly and as boxed areas to

The Hokum has a more homely cockpit, with cosy seating too

Fly Combat Air Support to keep the ground war moving

keep the frame rates up. The edges of forests are broken up with individual pieces of foliage that makes the overall effect convincing enough. It may not be up to the photo-realistic standard of Gunship!, but the undulating terrain shoots by at blistering framerates and at up to 1600 x 1280 resolution.

In flight both helicopters perform beautifully, being agile and responsive. The flight model can be tuned to your liking and for ultimate realism includes options such as retreating blade stall, rotor cross-coupling and vortex ring effect. Keeping your altitude low without hitting the deck can be tricky though, especially in the wind. The aircraft can be trimmed both in attitude and yaw by simply pressing the T key and the autopilot does a good job if you want to save your energy for the combat zone. When creeping up to a firing position the Hover Hold mode is a boon, as is the mast-mounted radar that allows you to stay just below the crest line if you get it right.

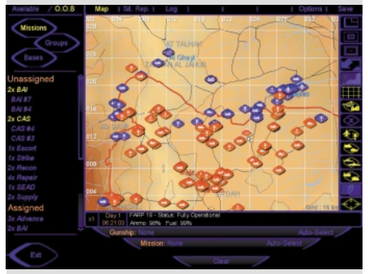
The only significant omission is the lack of auto-rotative landings. You can 'glide' the chopper with zero collective applied and pull-up and max out the collective at the last minute for a survivable landing, but it's not quite the same as a true auto-rotation. Apart from that, you'll find no better helicopter flight model than Comanche Hokum. The latter is particularly fun, as the flat turns and wingovers at speed make for some unrivalled dogfighting maneuvers. The unique crew ejection system will save your skin a few times, guaranteed.

Powerlines and dense forest make for some lush landscaping

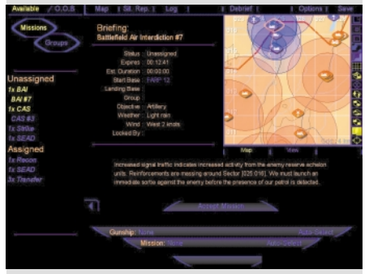
Detail, detail, detail

Things have come a long way from painted lead figures. Every combat unit is fully articulated, from the limbs of the infantrymen to the cargo doors on the C-17.

Power Play

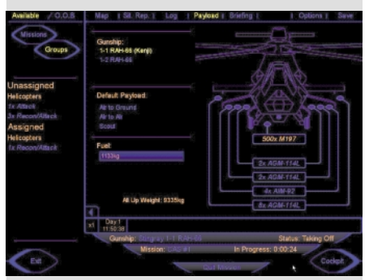


Keep track of the campaign and available missions from the main screen

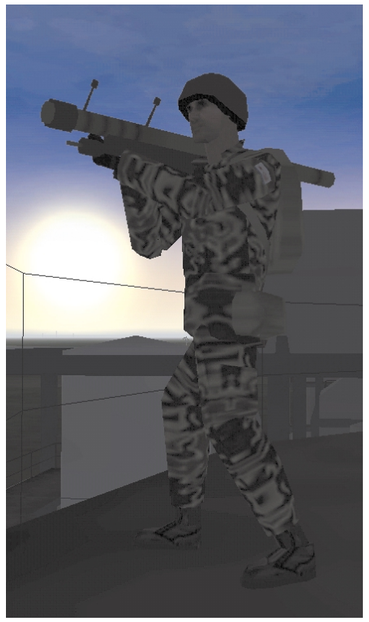


Pick and choose where you want to fly, and in which chopper. Then take-off and do some damage

Keep tabs on how the war is turning via the Sit Rep screen



Pack in that firepower



Watch out for those sneaky portable SAM devils

While the mechanics of Comanche Hokum are well executed, it is the dynamic campaign that makes this such an engrossing experience. You do not simply fly missions, but are immersed into a complete war. Three new campaigns, based in Yemen, Taiwan and the Lebanon, provide the backdrop for your sorties. Over a thousand units slog it out on the battlefield and a continuous stream of missions is generated by your commanders in real-time. Typically, reconnaissance of enemy positions is required before strikes can be launched. However, units that are in trouble may call for close air support or a battle damage assessment mission may be required following a strike. This level of unpredictability means that the action is always absorbing and events are truly affected by how you perform. For more of a quick fix, mini skirmish campaigns are available that only use a corner of the map. These are also better for multiplayer games, requiring less bandwidth.

To keep the action content up, as soon as a mission is completed a debriefing screen is displayed and you can let the computer fly the return leg, allowing you to hot-seat into another helicopter for the next sortie. It is also possible to observe the battle from any unit's position, with an excellent external view menu system. Hopping around the battlefield shows off the incredible modeling of the other combat units. Tanks, SAMs and even individual troops have fully animated parts and go about their business with aplomb. It's fun to just sit back and watch the battle unfold before diving in and claiming some scalps.

And the less subtle Ack-Ack too

Uh-Oh. Running into trouble Downtown

Owners of Apache Havoc will be pleased to learn that the sequel blends seamlessly with its predecessor. Using the (included) version 1.1E upgrade patch and installing Comanche Hokum means that you can play any of the campaigns and fly all four helicopter types. This makes for a fantastic battlefield experience as you hop between Comanche/Apache or Havoc/Hokum choppers to carry out your duties. As Apache Havoc is now available on budget label (for around 10 quid), it's well worth investing if you don't already have it.

Overall, Enemy Engaged has enough depth to keep the most die-hard helicopter fans happy. By providing plenty of options and a simplified mode for beginners, it is equally suitable for rotorcraft rookies. With the dynamic campaigns provide so much more gameplay than scripted missions, this may not look quite as good as Gunship!, but it captures the essence of helicopter warfare a whole lot better. ■

Kenji Takeda

REVIEW SCORE:

Publisher: Empire	**Price:** £29.99
Website: www.enemyengaged.com	**Release Date:** Out Now
Developer: Razorworks	

Pros: Strikes the balance between gameplay and realism perfectly

Cons: No single mission mode for a quick fix and not as photo-realistic as Gunship!

System Requirements: Pentium 200, 32Mb RAM
Recommended: P II 450, 128Mb RAM, 3D graphics card

Gunship!

Feeling like James Bond? Take the Eurocopter Tiger for a spin

A year is a long time in computing. Nine years is an age. So when rumours became reality and the sequel to Gunship 2000 was announced, there was huge excitement among chopper sim fans. Gunship! is finally here, ahead of its stable mate Tank Platoon!, and on the surface it certainly looks like it was worth the wait.

Quite simply, this is the most beautiful helicopter simulation to have ever graced the PC. The screenshots here are just a taste of the lush environment that Gunship! immerses you in. The graphics engine is a remarkable achievement, not only providing incredibly detailed landscapes and vehicles, but doing so while maintaining excellent frame rates. It even looks good in software rendering mode.

The Eastern European countryside lends itself well to helicopter combat. Whichever way you look there are farms, forests, buildings and yet more trees. And to a chopper pilot that spells c-o-v-e-r. Ducking and diving amongst the undergrowth is the key to survival, and no other sim has managed to model this as well as in Gunship! Individual trees are built up into woods and forests, complete with clearings and swathes through which you can creep along a few feet off the ground. This sets the adrenaline pumping, as the eneemy loves to hide in these nooks and crannies too, so you never know what's around the corner.

Staying low and out of sight is not just the key to success, but a prerequisite for survival. The enemy troops are savvy and definitely up to date in their weapons training. Pop your head out for more than a couple of seconds and expect to get a faceful of SAM. This game may be

THANKS FOR THE MEMORY

The grandfather of them all, Gunship has been around since the dawn of colour PC computing. Four colours that is. For those of us who couldn't afford such powerful office computers, the Commodore 64 bore the brunt of the simulated Air-Land war in the late 80's. The graphics were primitive: pyramid mountains, an orange desert and white dots for targets. The game play was all there though and it helped cement Microprose's reputation as the leader in flight simulations.

Since then, the evolution of the Gunship series has been unhurried, to say the least. It took five years before Gunship 2000 hit the PC, when the new CPU on the block was the almighty 486 – Whoa! It was well worth the wait though, and set a legendary benchmark in helicopter simulations that wasn't topped until Janes' Longbow II. So here we are, nine years later and Gunship! completes the trilogy.

DEADLY DUO

Gunship	1986
M1 Tank Platoon	1989
Gunship 2000	1991
M1 Tank Platoon II	1998
Gunship!	2000
Tank Platoon! (hopefully)	2000

Set for stun. These are the best graphics in any flight sim to date, bar none

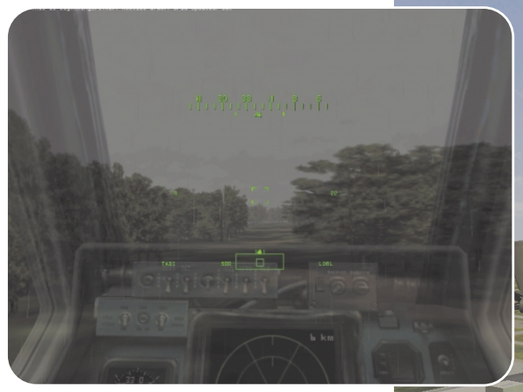
Support those ground troops and they'll protect you. All manner of artillery support is available, but only if you ask nicely

aimed at beginners as well as more experienced PC flyers, but even on the easiest level you have to do some textbook combat flying or you won't last more than two seconds.

Microprose has always done well to produce balanced flight sims that appeal to the masses, but may have failed this time. Here you have the choice of either flying the helicopter as pilot, or settling for the gunner's position. Unlike Enemy Engaged - Comanche Hokum, this distinction is absolute; you can't fly from the gunner's seat, nor easily kill targets while flying the helicopter. In theory you could do the latter, but the diabolically slow panning view makes it impossible in practice. Best to leave the shooting to the back seat and concentrate on staying out of sight .

This is a less than straightforward task given the peculiarities of the flight model, though. There are three levels of realism, from arcade to (supposedly) realistic. The latter proves itself to be less than stunning though, with annoying rudder and collective control pedal responses. It's not that hard to keep up in the air, but trying to fly tactically can be quite a struggle.

More enjoyable is the back seat role. While you're busy taking out targets, the flying is left to the autopilot. On the whole, he does a reasonable job but has occasional lapses of concentration when he bashes into things. In gunner mode the joystick is used to pan the view, which can be completely disorienting and nauseous if done too quickly. You get used to it after a while and scanning for targets, sighting them and putting them out of action is the most satisfying part of the game by far. To help in this pursuit, you can give the pilot commands to bring you on target, although he seems to feign deafness when being told to turn left and right sometimes. Once locked onto a target, the TADS view is the place to track the



If only real cockpits were this see-through

Shoot and scoot in the city. This kind of fighting is real bad for the nerves

Use the TADS view for a real insight into the gunner's world. And ain't that a sight to behold

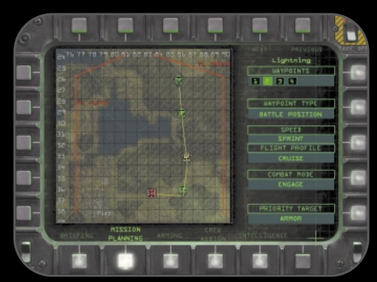
No rest for the wicked...

CRY HAVOC

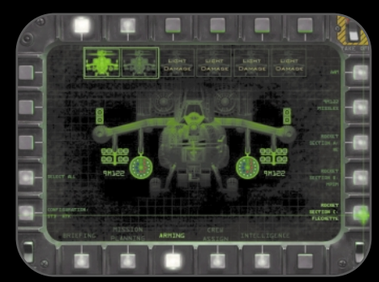
Pretty cut scenes add background atmosphere for the five campaigns

The overall strategic plan seems straightforward enough

Mission briefings are concise but clear



Mission planning screens are a no-nonsense affair



Just load up, pick your crew and its up, up and away

See in the dark at its best. You can even pick out the hottest parts of each tank

The Mil-28 has all mod cons

SNAPPING AT THE HEELS

The third combat helicopter simulator to be released in almost as many months is KA-52 Team Alligator from Simis. The sequel to Team Apache, it aims to bridge the gap between hardcore simulations and action-packed shoot 'em ups. Of course, striking this kind of balance right is what every flight simulation producer wants, and Simis has managed to get closer than most.

By relegating much of the avionics to the co-pilot AI, you can concentrate on flying and just have to hit the trigger when suitable target is chosen for you. This works rather well (in sharp contrast to Gunship!) and the slick graphics engine makes for a thrilling low-level experience. The problems come with the flight model. While Beta versions flew rather nicely, last minute changes from GT Interactive and Simis meant that the boxed version of KA-52 TA shipped with practically non-existent flight physics. For a tweaked flight model that is more akin to the decent development version, check out http://ka52.sim-arena.com/ and download Zero G's FM patch from the files menu at the top right of the web page.

Mastering the KA-52 is made easier with the help of Kapitan Sutyagin, whose soothing Russian voice talks you through all of the systems on board in the six training missions. Instant action, single mission and two campaigns are included to provide a reasonable selection for the novice pilot. The action comes thick and fast, but the realism level is somewhat diluted. Slash-and-Run tactics work far better than in the real world. Try that in Gunship! or Enemy Engaged and you'll be scrap metal in no time.

A novel crew management mode runs throughout the campaigns to add some depth to the proceedings, but can be tiresome (and can be turned off). However, the linear mission structure, peppered with occasional rescue missions for downed pilots, is too restrictive to provide much novelty for frequent players.

While KA-52 Team Alligator is a little easier to get to grips with and provides more instant action that Enemy Engaged, it does not have the sustainability and depth to keep you hooked as you become a better pilot.

intended victim. A real highlight of this is the infra-red mode. The usual green glow is as eerie as ever, but the heat signatures of tanks and other vehicles is so detailed that you can see their exhausts and gun barrels glowing hot. Again, the graphics engine is the highlight as continuously directing the pilot with instructions that are only vaguely followed becomes frustrating with time.

The Mi-28 Havoc, venerable Apache (in US and UK variants) and Eurocopter Tiger provide a nice selection of steeds for you to master. The controls in each is the same, although they do have distinctive cockpits and a few unique characteristics. The viewpoint in the virtual cockpits is zoomed way in, so the instruments are easily readable, but tend to block the view unduly. To counter this, the cockpit can be made translucent, or dispensed with completely for an arcade-shooter like full screen view.

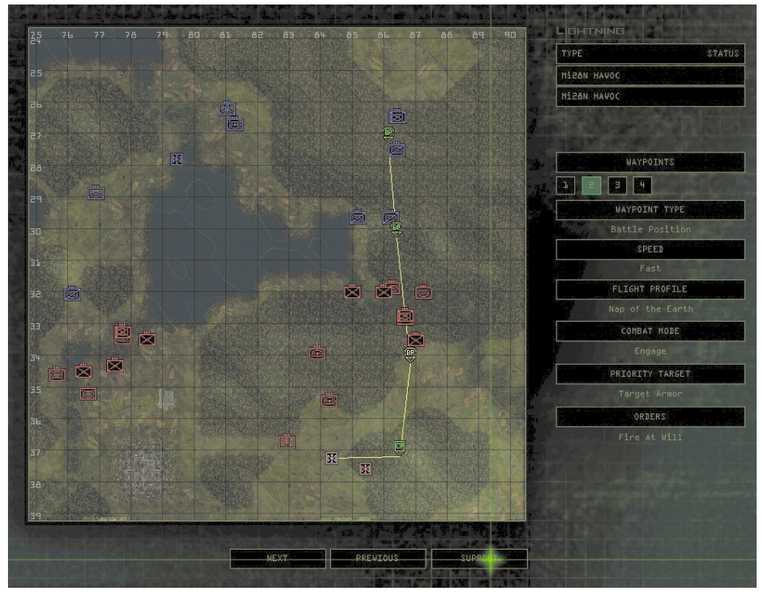
For action addicts there is a good Instant Action mode that randomly drops you into one of the four helicopters and sets up a straightforward mission. This is perhaps the best mode, together with the selection of pre-scripted single missions providing more involved tasks.

The heart of the game are the five campaigns set in Eastern Europe. These are presented well, with slick movies and background historical notes to put you in the picture. The mission planning and intel screens are well laid out, and you can also have a hand in selecting crew members to fly with.

The missions themselves usually involve other units, with a full ground war taking place around you. The radio waves are filled with traffic as friendly forces call in support and report on sighting enemy units. This creates a tremendous atmosphere that is totally absorbing. Unfortunately, the peculiarities of the flying detract seriously from total enjoyment of the experience. The most disappointing part of the campaigns is their strict linear nature. You must complete a mission before moving on. Failing to meet your objectives gives you the choice to fly again or quit the campaign. This destroys any continuity in the proceedings and is a real disappointment.

Gunship! is a mish-mash of a product that has many neat design ideas that just don't come together very well. The graphics will certainly sell the game, but the game play is where it falls down. Flying the helicopter is challenging, but has a limited fun factor due to the difficulties with simultaneously being able to kill targets. The gunner's position is a blast, but the autopilot AI becomes frustrating to deal with when the missiles start flying all around. Flicking between the two provides a fun overall experience, but not a particularly coherent one. Gunship! may look better than Enemy Engaged, but the latter is a much better all-round simulation of helicopter combat. ■

Kenji Takeda



Urghhh! The comms and in-flight navigation is a nightmare

Use the gently, gently approach or else you won't last long. The enemy are a sharp bunch

REVIEW SCORE:

Publisher:	Hasbro Interactive	**Price:**	£34.99
Website:	www.gunship.com	**Release Date:**	Out Now
Developer:	Microprose		

Pros: Jaw-dropping graphics and a neat simulation of the helicopter gunner's position

Cons: Flawed game play, restrictive campaigns and annoying bugs/features

System Requirements: P II 266, 32Mb RAM, DirectX 7 sound/video card

Recommended: P II 350, 128Mb RAM, 16Mb 3D graphics card

Nothing motivates like success

Attention to detail: note the HUD

JANES F/A-18

The best person to assess the intimate detail of the avionics, flight model and weapon systems of a really complex simulation like Janes F/A-18 would undoubtedly be a fully qualified F18 pilot. These are scarce in the PC Pilot offices, but there are certain things we do know for sure. One is that if a rookie pilot were to make a hot and high approach to the carrier, ignore a frantic wave off, dump his plane on the deck, wipe off the undercarriage and finally slither to a halt a few feet from the big drop, his instructor would not say: "Congratulations, you have successfully completed this training mission." But that's what happened to us.

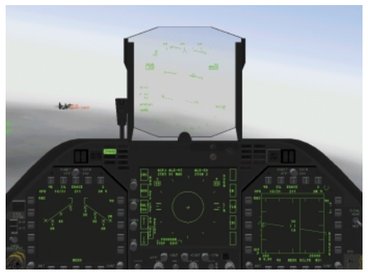
Later that day, during final day carrier qualifying (our nutty instructor let us have another go), we were despatched into a busy traffic pattern without being allocated a callsign. We worked out we must be Mercury 62 as this was the only aircraft not replying on the RT!

So there are a few things that don't work perfectly, but there are many more that do. Controversially, Janes have chosen to reproduce every knob, switch and dial in a 3D rendering of the F/A-18 cockpit, and most of them are functional. The majority have keyboard shortcuts of course, whilst others must be operated manually, by mouse click. The associated systems are similarly reproduced as accurately as security concerns allow. Realism is therefore not an issue.

All this is fine for the so-called hardcore simulation fanatic, but what about the less dedicated? Not everybody wants to go through three weeks of ground school before getting airborne, let alone being allowed into combat.

Janes have made a good stab at making F/A-18 accessible to the novice. The documentation openly refers to the adjustments possible to almost every aspect of the simulation as 'cheats', a word with unfortunate connotations. We prefer to think of them as realism options and they cover the usual things such as the flight model, invulnerability, overly-smart weapons, unlimited fuel - and even an invisible instructor in your single-seater who comes up with helpful information like 'The target is behind you.' Well, isn't it always?

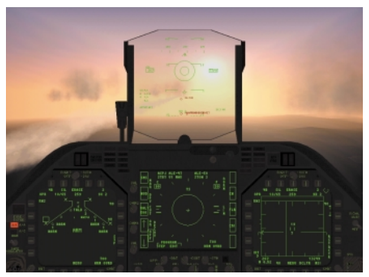
Although hardened combat veterans may turn their noses up at such features, they shouldn't. After all, they can leap straight in with the realism settings at maximum against ace enemy pilots, if they want to. For the less expert, these options allow skills to be learned progressively and extend the useful life of single missions and the campaign. They are all the more important in this simulation as the training missions tend to be rather inflexible. The Sidewinder training mission, for example, sets you up behind a single 'unsuspecting' Mig with master arm switch on, the target designated on the radar and the right missile selected.



A Mig 29 is escorted from Allied airspace. The red label is a realism option

Grotty Northern European weather as our F/A-18 breaks cloud to attack mobile ground vehicles

An F18 pilot inspects his handiwork



A HARM is on the way, but now we have to evade the incoming missile

You are instructed how to lock up the target and fire the missile. Do what you're told and you'll find out what a Sidewinder kill looks like. If you depart from the brief you may find that you can't reselect the missile or change the radar range. Fortunately, this doesn't happen outside the training environment.

Nothing is more disheartening for the beginner than repeated failure, yet nothing motivates more than success so it's important to get in some early kills, by whatever method. By adjusting the realism settings in single missions, you can really get to grips with the aircraft systems, practice your ACM (air combat manoeuvring), make the inevitable mistakes and live to learn from them.

Guns kill – a bit too close for comfort!

You can almost feel the heat and hear the noise

As the enemy AI (artificial intelligence) is also scalable, you may chose to fly against novice opponents with the realism turned up. Or turn it down to gain valuable experience against enemy top guns without getting wasted every few minutes. What Janes offer here is a simulation simulator. Of course, anyone who crows about their prowess in standalone missions or the campaign while employing these artificial aids is only fooling himself.

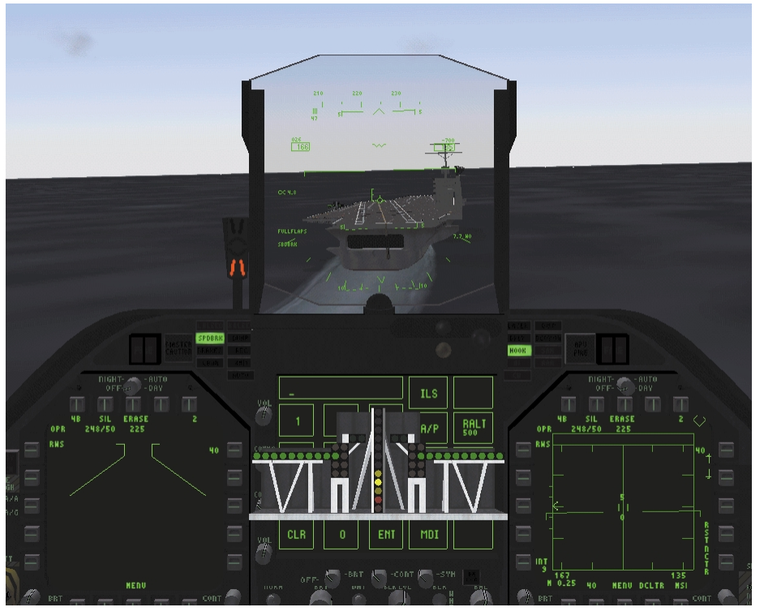
While F/A-18 offers copious amounts of online help, there is simply no substitute for a good paper manual, and this 236-page example is utterly comprehensive. The manual falls naturally into four sections. The chapters in the first section are taken up with handling the game interface: how to navigate around the various menus, handle pilot records, set up multi-player sessions via modem etc. The next 50 pages are concerned with simply flying the aircraft and learning its basic systems. Then comes combat, with 137 pages of information on weapon systems and avionics. Here you learn how to fight with the aeroplane – which is the real object of the exercise.

Navigation is the manual's weak point. On our day carrier qualification ride, the briefing was to take off and immediately join the landing pattern for a trap back onboard. What is the beginner to make of the ATC instruction 'establish on the one seven zero radial at range 22, angels 8'? With just one and a quarter pages devoted to navigation, it's no surprise that VOR/TACAN procedures aren't covered. Without knowing that Marshall is the name for a carrier's approach radar, and that 'establish' means 'position while heading towards', you have virtually no chance of completing this mission correctly.

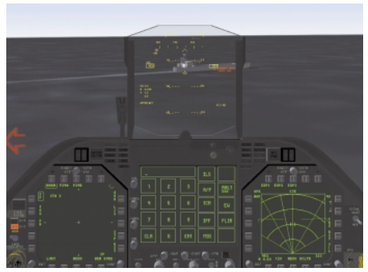
One of the big challenges faced by rookie and ace alike is how to physically manipulate all those cockpit controls. In the real thing you just reach out and do it. The simmer has no such luxury. As usual, Janes have supplied an excellent keyboard reference card with a labelled keyboard on one side and all the commands and keyboard shortcuts listed on the other. It does not include mundane operations like firing and releasing weapons and leaving aside the 24 external camera

Air to air refuelling will tax the skills of even the most proficient pilot

Rolling out behind the tanker



Call the ball. A representation of the meatball pops up in the cockpit at 3/4 mile – an essential simulation aid



Ground object detail is only average really close up

About to pick up the no.3 wire

controls, there are 108 functions! When you need to do certain things with the MDIs (Multi Display Indicators) you have to push the buttons directly on-screen, letting go of the joystick and using the mouse. Again the real pilot has it easier, making a quick stab with a finger of his left (throttle) hand.

Never has a good throttle and joystick combination with lots of user-definable buttons been more important. No joystick has enough buttons for this simulation. Sadly, the super-programmable Masterpilot keyboard expander – which looked just like the display from a modern jet fighter - is no longer available and the only other option is the much less comprehensive Saitek Command Centre.

Beyond the single missions lies the campaign. Yes, there is only one, but it has four complex phases, each with plenty of missions that you won't have flown before and excellent background information. There is also plenty of opportunity to customise each sortie. If you think you know better, you can change the weapon loadouts, tactics and routing carefully worked out by the operations staff. Only the resources and the mission objective are fixed.

However, for a small group of people even this won't be enough. For them, learning how to fly and fight, mastering the single missions and completing the ready-made campaign is just the beginning. Mission builders step forward: the final 33 closely packed pages of the manual are just for you. Indeed, for some military flight simulation enthusiasts mission building is what it's all about and F/A-18 doesn't disappoint. There's enough here to keep dedicated mission builders happy for months and Janes have thoughtfully provided step by step instructions and a sample mission for the less initiated.

Graphically, F/A-18 is superb. If anything, the ground is a little dark and we needed to turn up the brightness and contrast on our monitor for best results.

Head down: the complex cockpit

Glare from a CRT screen as the sun swings behind you

The 3D-rendered cockpit is super-realistic

Accurate moving surfaces and super textures

One second to bomb release

ALSO CONSIDER

Software Title:	F/A-18E Super Hornet
Publisher:	Titus
Website:	www.superhornet.com
Price:	£34.99
PC Pilot Rating:	
Software Title:	Jane's USAF
Publisher:	Electronic Arts
Website:	www.janes.ea.com
Price:	£39.99
PC Pilot Rating:	

Rounding out after a perfect approach

The 3D cockpit has attracted some criticism as a frame rate hitter, but there's the option of pure HUD (Head up Display) mode to counter that. The in-flight graphics are excellent, with a moody look we haven't seen for ages. The details of parked aircraft and buildings aren't brilliant really close up, but that matters little.

So, if you are looking for a super-realistic, technically complex and graphically impressive flight simulator, Janes F/A-18 is hard to beat. If you are very new to flight simulation, this is not really the place to begin. Civil simmers that can find their way around an HSI (horizontal situation indicator) will certainly have a head start. Those used to other Janes simulations like F15 or even USAF will find themselves on familiar ground, but with expanded horizons. ■

Tony Jones

DON'T FLY WITHOUT THESE!

Be sure to print out the readme file before you start. It runs to 12 pages of A4 and lists various enhancements incorporated since the manual was printed. Even better, go through it with the manual open and annotate the various sections in the margin. Otherwise you will be wondering why the last missile you launched didn't guide properly.

The patch (F18upd01.exe) downloadable from Janes' website is equally essential for proper performance. A complete list of all bug fixes and updates isn't possible here, but some of the more important are: Numerous CTD (Crash to Desktop) bugs fixed, ATC and avionics improvements and weapon loadout bugs. Most importantly for rookie naval aviators, the single mission manual carrier landing no longer starts you off hot and high, forcing you to conduct the entire approach with the throttle closed and the speedbrakes out in an attempt to get the airspeed back under control!

We are disappointed that Janes released F/A-18 with so many bugs – effectively using their first batch of customers as 'test pilots' - but at least they have taken prompt and comprehensive action to sort out the problems. Apart from the minor points in the review, it ran very smoothly and accurately.

REVIEW SCORE:

Publisher:	Electronic Arts	**Price:**	£39.99
Website:	www.janes.ea.com	**Release Date:**	Out Now
Developer:	Janes Combat Simulations		

Pros: Technically complex: masses of detail. Wide range of realism options. Excellent mission builder.

Cons: Technically complex: not for beginners. Poor frame rate on low spec PCs.

System Requirements: P II 266, 64Mb RAM, 3D graphics card
Recommended: P II 350, 64Mb RAM, 16Mb 3D graphics card

VIP Classic Airliners 2000

VIP BA Viscount on takeoff from Heathrow

Fly one of the Classics

Although Microsoft's Flight Simulator 2000 comes with a fair range of aircraft straight from the box, it's not long before most of us thirst for new aircraft to fly. Partly to expand our flying experiences and partly because it's just nice to have a change. With new aircraft appearing daily on web sites like avsim.com and flightsim.com, there doesn't seem to be any shortage of designs, or designers to choose from. As it happens, some of them are producing better free models, in many cases with greater detail, than some of the commercially available products.

This latest re-release from VIP called Classic Airliners somewhat highlights the point, because the fuselage structures and engine casings for the most part are created with just eight sided polygons (12 for the Trident). The windscreens although stated as transparent on the box, do not appear to be so and the completely redesigned aircraft are little changed from their previous versions. Have the VIP designers not seen many of the latest aircraft sporting fuselages designed using twelve, sixteen and recently even thirty-two sided polygons? In addition the textures are created using 256 x 256 rather than the 512 x 512 pixels supported by FS2000 and not one of the jet aircraft in the package has rotating fan blades.

A superb freeware 727-200, well worth a look!

The paint job on this freeware aircraft is amazing

Complete with 12 sided fuselage and transparent windows

Side view showing correctly located flaps

> ***...many of these aircraft are now available as freeware...***

Of course the purists will say that these criticisms concern items that are purely cosmetic, which clearly they do, but if the designers of freeware aircraft offer these enhancements, we see no reason to recommend paying for products that don't. In other areas of software development the freeware and shareware authors strive to keep pace with the professionals but it seems that in the flight simulation world the reverse is true. If producers simply regurgitate products in an environment that has so many gifted amateurs, they are going to find it difficult to sell them to a progressively more aware customer base.

The original Classic Airliners package was hailed as a collection of classic aircraft, with custom panels, flight models and liveries that at the time were not readily

Other Freeware Examples

A Continental 737-300 with 16 sided fuselage and rotating fans

Side view of Continental Freeware 737

Crisp textures on the Delta Airlines 737

Front View of KLM 737 showing 16 sided fuselage

Freeware United 727 side view

A selection of VIP Classic Airliners 2000 aircraft

Boeing 707 TWA

Douglas C42

Douglas C54

Lockheed Electra 188

VC10 on the tarmac

The 12-sided VIP Trident

BAC 111-500 Bahamas

BAC 111-500 Ryan

available from any other source. However, times have changed and many of these aircraft are now available as freeware, downloaded at the cost of a phone-call.

On a more positive note, the cockpits in this release have all been reworked, are crystal clear, well designed and more representative of the original equipment. They are also now compatible with the Flight Simulator 2000 GPS (Global Positioning System) and include glass effects and night lighting on the instrument panels. The airframes exhibit more animated parts, with flaps and spoilers deploying smoothly, but more importantly after many test flights the aircraft fly well and behave exactly as expected.

> ***The selection of aircraft is quite extensive...***

The selection of aircraft is quite extensive, including such classics as the De Havilland Comet, Douglas DC-3, Hawker Siddeley Trident and Vickers VC10, which we understand is still in service with the RAF. These are provided as before in literally dozens of liveries, accounting for most of the world's airlines, both past and present. It's a pleasure to see the distinctive Pan Am logo take to the air once more.

On balance, if you didn't buy the first Classic Airliners, then you still get a lot of aircraft for your money. However, VIP could have done much more to enhance the external views of these aircraft. See the comparative screen shots and make up your own mind. ■

Joe Lavery

Close-up of VIP BAC 111-500 external composition

Engine-housing from 8 sided polygons

Blocky 111 fuselage, again only 8 sides

Wheels display the same chunky appearance

REVIEW SCORE:	
Publisher: Just Flight	**Price:** £24.99
Website: www.justflight.com	**Release Date:** Out Now
Developer: VIP	
Pros: Offers a good range of aircraft for new users	**Cons:** Needs more in it to justify an upgrade
System Requirements: Pentium 200 MMX, 32Mb RAM	
Recommended: PIII 550, 128MB RAM, 3D graphics card	

ALSO CONSIDER

Software Title:	The Legendary Aircraft Collection
Publisher:	Just Flight
Website:	www.justflight.com
Price:	£24.99
Software Title:	Classic Wings 98
Publisher:	Just Flight
Website:	www.justflight.com
Price:	£24.99

Private Wings

Climb aboard your own private wings

Over the past few months we've seen many aircraft collections for Microsoft's much berated Flight Simulator 2000, covering everything from motor gliders, to giant multi-engined transports. The quality of these collections is sadly just as varied. However, this latest release from Data Becker, called Private Wings, falls firmly on the positive side, with high quality renditions of the aircraft, both in terms of the flight models and in their visual accuracy. They also come with dedicated, fully working cockpit panels that faithfully reproduce the original layouts and where possible a second rendition with an alternative instrument array is provided. Incidentally, you get an authentic checklist for each aircraft too.

The package includes some of the best General Aviation (GA) models on the market, as well as a couple of dream machines. The Cessna Citation comes to mind as one of the aircraft that falls outside the budget of most people… unless of course you're a pop star, or Bill Gates.

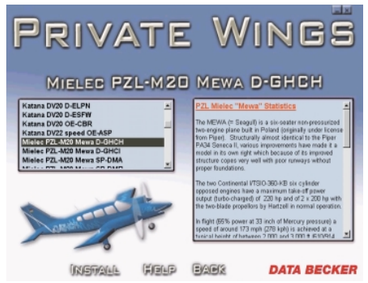
The box boasts 36 aircraft although you only actually get 13 different planes, the rest are simply variations in livery and minor model changes. Nevertheless, they represent a reasonable collection for the price and offer better value than some of the recent collections we've seen containing just three aircraft. The same observation is true for the manual, which contains over 200 pages complete with photographs and illustrations. Describing every model in great detail, down to the individual flight instruments and how they're used, it's fair to say that this is one of the best manuals we've seen, particularly for an add-on.

Installing the aircraft is simplicity itself. By using the Private Wings installation routine you simply select the model you want from a scrollable list, click on the install button and your choice is installed seamlessly along with its own panel, gauges and sounds in the Flight Simulator 2000 aircraft directory. You are then ready to go! As an afterthought, we were especially impressed with the high quality bitmaps, specifications and statistics of each aircraft that we saw as we made the selections.

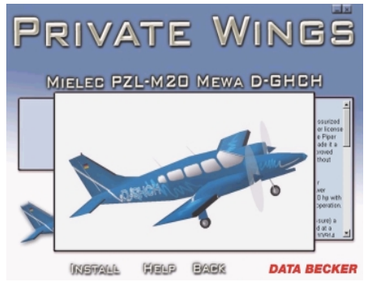
The entire aircraft collection features fully animated engines, undercarriage (that stow correctly), moveable rudders and flap assemblies. More importantly, they feel right. The flight models are truly representative of the aircraft they depict. For example the 'real' PA28 Arrow has a tendency to float along the runway, almost refusing to give up the air and the Seneca Twin has an amazing climb rate. The Data Becker versions are exactly the same. Altogether, this is a quality collection that we feel virtual pilots should seriously consider, based on the price alone. ■

Joe Lavery

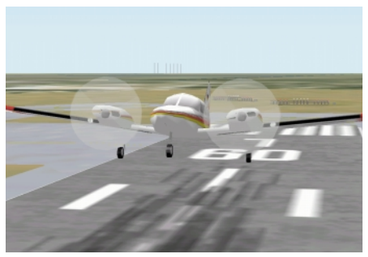
The stylish Rockwell Commander above the tarmac



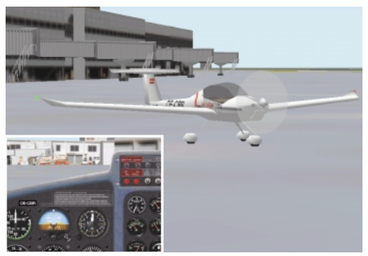
Check out the statistics before installation



A second mouse click opens a high resolution picture of each aircraft



The MZL Meilec crosses the threshold



The Katana DV20 and panel section

The panel from the Rockwell Commander

REVIEW SCORE:

Publisher:	Data Becker	**Price:**	£19.99
Website:	www.databecker.com	**Release Date:**	April 2000

Pros: Provides users of Flight Simulator 2000 with a new range of aircraft to fly.

Cons: Not all aircraft have transparent canopies (being picky here)

System Requirements: Pentium II 350, 32Mb RAM

Recommended: P III 550, 128Mb RAM, 16Mb 3D graphics card

List of aircraft included

Cessna 185 Skywagon (3 Variants)
Cessna 560 Citation (4 Variants)
HOAC Dimona (2 Variants)
HOAC Katana DV20 (3 Variants)
HOAC Speed Katana DV22 (1 Variants)
PZL Mielec "Mewa" (4 Variants)
Piper PA28 Archer II (3 Variants)
Piper PA28 Arrow IV (2 Variants)
Piper PA34 Seneca III (4 Variants)
Piper PA34 Seneca V (2 Variants)
Robin DR-400 President (1 Variants)
Robin DR-400 Remorqueur (3 Variants)
Rockwell Commander 114B (4 Variants)

Final Approach

"Contact tower once established on the localiser"

The majority of flight simulation enthusiasts are dedicated, knowledgeable individuals, who go to sometimes extraordinary lengths to make their simulated experiences as realistic as possible. This includes both the flight planning and procedural stages of the flight, not just the execution of the flight itself. A short stop at any of the virtual airline web pages will clearly show that these activities are taken very seriously.

In order to reach this degree of realism, pilots need to have more than just the skill to fly a plane. They also need accurate maps, a detailed flight plan and in order to arrive at the designated runway threshold, a set of approach plates for the destination airport. Unfortunately, except for a few major airports, these are not supplied with Microsoft Flight Simulator and the growing collection of add-on scenery products rarely include the requisite set of plates.

Enter the latest release from Just Flight called Final Approach and written by Georges Lorsché, which is designed to address this shortfall by providing users with the tools to create accurate approach plates for virtually any airport in the world. The plates are in two parts, with the plan view showing an overhead view of the airfield with accurate locations of Navaids, frequencies, holding positions and runway ILS. The second part displays the profile view, showing basically the same information in profile, including the glideslope, missed approach points, visibility minima and distance to run. This information will naturally vary depending on the navigation equipment at the airfield in question.

The CD-ROM contains approach plates for thousands of airfields around the world, so the comprehensive editing functions would only be required when a plate needs updating, or if you want to fly to some remote location. What's more, the printouts are superb, because Final Approach uses vector based drawing techniques to create the plates. This means that the printed output will be at the highest resolution your printer can support.

You can use the 'Situation Link' function to practice approach procedures from specific airfields by simply setting an initial approach position, heading and altitude. The parameters are then transferred to Flight Simulator, Precision Simulator or Fly! in the form of a situation file, together with the appropriate ATIS, COM and main Navaid radio frequencies. If you want to be really lazy you can even get Final Approach to dial the approach heading and altitude into the autopilot and activate the autopilot for you.

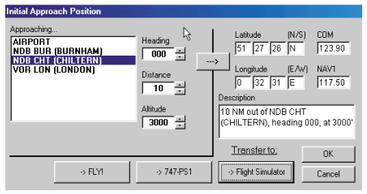
As well as the facility to create approach plates, Final Approach also includes one of the most comprehensive procedural tutorials we've ever seen. Covering every phase of IFR (Instrument Flight Rules) flight, and every type of procedural approach. Encompassing ILS, VOR and NDB approaches, procedural turns, teardrop course reversals, holding over a VOR or NDB, in fact the whole catalogue of procedures necessary for accurate IFR flight. The text is interspersed with clear detailed illustrations that highlight each phase and where practical a selectable 'film' button will play a video clip to demonstrate the point.

The tutorial also describes the various map symbols you'll encounter and in most cases will show the aircraft instrument that relates to the navigation device in use. If you simply want to understand the intricacies of instrument navigation, this tutorial will certainly demystify it for you. ■

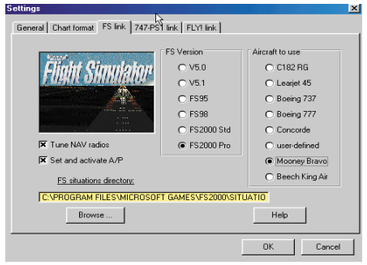
Joe Lavery

Footnote: Of course, regular readers of PC pilot will already have a head start if they've been following the excellent series of VFR/IFR articles from Bill Stack.

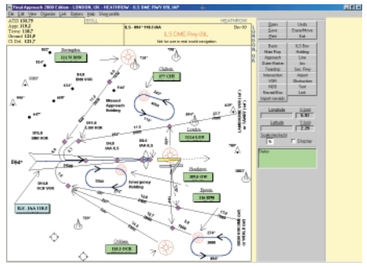
The tutorial is quite a bonus, providing plenty of information, clearly illustrated, with each screen explaining in simple terms both the theory and practical side of IFR procedures.



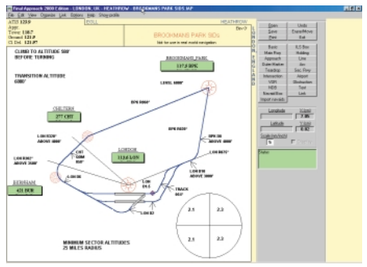
A single click sends the information across



The screen links Final Approach with Flight Simulator



Plan view of Heathrow showing ILS details for Runway 09



A SID (Standard Instrument Departure) plate for Heathrow

REVIEW SCORE:

Publisher:	Just Flight	**Price:**	£24.99
Website:	www.justflight.com	**Release Date:**	Out Now
Developer:	Georges Lorsche		

Pros: Solves the mystery of approach plates

Cons: Not for the casual flyer

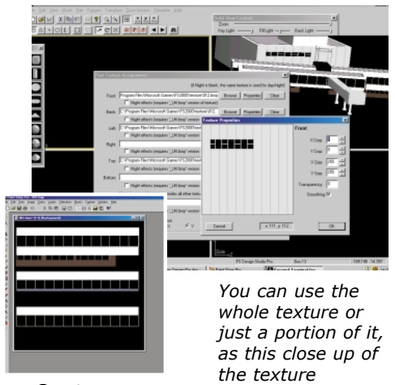
System Requirements: Pentium 200 , 32Mb RAM

Recommended: P III 550, 128Mb RAM, 16Mb 3D graphics card

FS Design Studio Pro

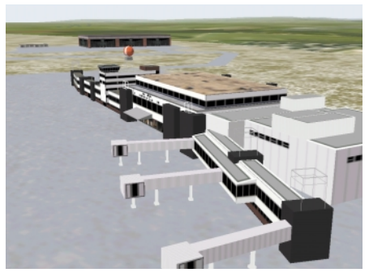
The beginner's guide to empire building

Now that Abacus have released their eagerly awaited Design Studio Pro, we can set about customising the Flight Simulator world. We asked Joe Lavery the author of the original preview to have a more incisive look at the finished product. Over to you Joe....



You can use the whole texture or just a portion of it, as this close up of the texture dialogue shows.

Create your own textures with any paint package.

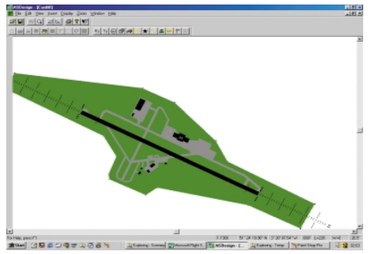


The wire frame towers are created by simply ticking a box when you define the object size.

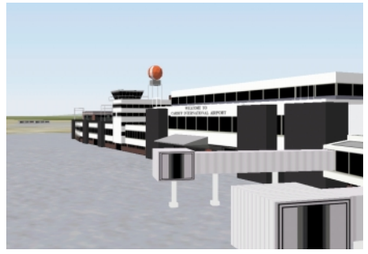
Design Studio Pro is based on traditional Computer Aided Design (CAD) concepts, so naturally the interface will instantly appeal to anyone with a 3D design or CAD background. The conventional four-view approach treads familiar territory, offering different elevations of the subject being constructed, combined with a perspective view at the same time. The various construction tools and methodology employed to use them is also based on traditional CAD but this shouldn't be viewed as a negative factor because these are tried and tested techniques. However, if you have no experience in this area, you'll be pleased to hear that the tutorials and help files that accompany the program are excellent. They lead you slowly through a number of different design projects, gently introducing the new concepts and construction methods without you realising it.

We thought a good test for a product like the Design Studio Pro would be to create something fairly recognisable, while bearing in mind how difficult it might be to achieve. We decided to try and customise the Flight Simulator world with a PC Pilot rendition of Cardiff Airport, (Joe's home airfield, by the way). The accompanying images should help you decide whether we achieved our goal and hopefully any professional designers reading this will bear in mind that this was our first foray into the world of scenery design.

We begin the project by firstly gathering together some reference material, in the form of airport schematics and photographs. This will help in the accurate design and placement of the buildings and may also be useful in creating textures to cover our bare building blocks. The first task is to determine the size and break down the complex structures into manageable pieces, not only to make the design easier to handle, but also to make sure they don't drastically affect the Flight Simulator frame rate.



You can position your objects visually using Abacus's Airport and Scenery Designer.

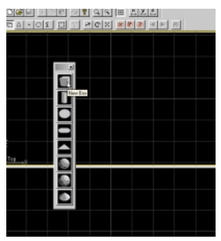


Make your windows transparent by defining the colour attribute

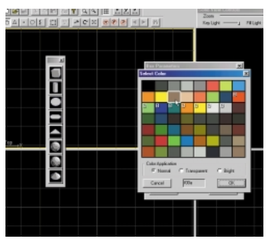
The main terminal is the biggest section so we'll concentrate on this first, using the programs facility to automatically create primitive structures that can then be edited into any shape you like. In our case, the Cardiff terminal building is more or less a rectangular structure, composed of three sections, with four large blocks at each corner. Simply defining their size in the box parameter dialogue created these shapes very quickly. As a matter of interest, the physical size of a building is one of the most difficult things to work out. It's okay if you have access to accurate dimensions, otherwise it's a mixture of guesswork and calculations derived from photographs or drawings. However, once you have a size, creating the blocks and positioning them correctly is easy, because the Design Studio interface allows you to zoom into an area a couple of inches across. It also has a user definable grid to give you some idea of scale as you work and the on screen objects cannot be moved accidentally, they stay precisely where you put them.

If you need to resize an object you simply decide on the resize axis, either x, y, or z and lock off the other axes before using the scale tool. You'll find in most cases that buildings don't have to be perfect, just a fair representation of the originals. If you desire perfection then the tools are all there, it just depends how far you want to go.

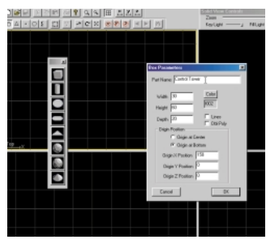
Creating a primitive object



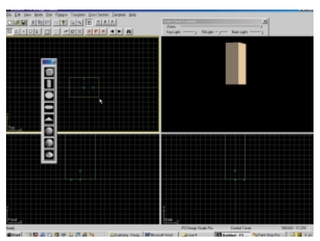
Select the type of object you want



Choose a basic colour

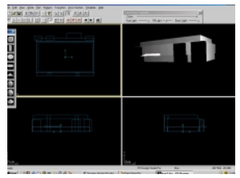


Give it a name and define its attributes

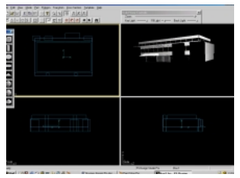


Click OK and there it is!

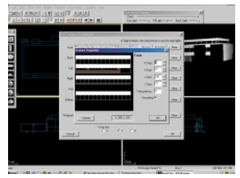
The stages of building our terminal



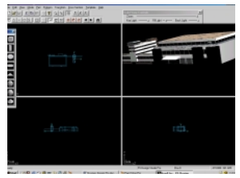
Stage 1 - Bare blocks



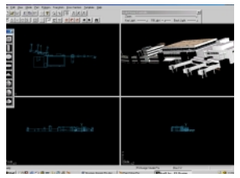
Stage 2 - with textures added



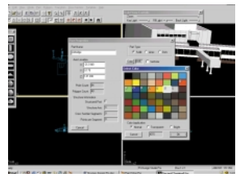
Stage 3 - Applying the Textures



Stage 4 - Control tower added



Stage 5 - Passenger lounge and airbridges



Stage 6 - Adding colours to non textured objects

The first arrival at our new airport.

There is currently no other single product that fully supports Flight Simulator 2000 for scenery and aircraft design, although Abacus Airport and Scenery Designer, and the freeware Airport 2.1 products are worth a look.

The final stage of construction is to add any bitmap textures to your objects to make them look more realistic, which is a bit like projecting pictures onto the walls. You simply right click while the object is selected, then apply the textures to the faces you need using the texture dialogue. The textures can be created with any decent paint package (we used Paint Shop Pro to create our Cardiff textures) and if you want to see some examples look inside the Flight Simulator texture directory.

Actually getting your new scenery into Flight Simulator can be done in a number of ways. You can send it straight from FS Design Studio in the form of an object file (.blg), after first defining its location by Latitude - Longitude. Output it as an SCASM source file (.sca), or SCASM macro file (.scm) for use with programs like Airport 2, or Abacus's own Airport and Scenery Designer. Finally in the case of aircraft, you'd use the (.mdl) format.

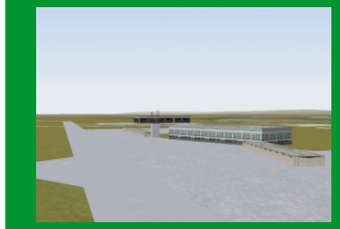
Although in the majority of cases you can create quite complex objects using the primitives we mentioned earlier i.e. box, tube, disk, oval, sphere or cone, there are many other tools and editing modes available to you. The only real constraints on design are those imposed by Flight Simulator in terms of file size or frame rate and of course your own imagination.

The Abacus FS Design Studio Pro is a superb package that's easy to use, yet capable of creating some stunning scenery. We have not fully explored its other main function, aircraft design, because we wanted to show a project from beginning to end, rather than a simple breakdown of what the program can be used for. Perhaps we'll take a look at aircraft design in another issue. ■

Joe Lavery

Cardiff as it was, is and should be!

These three pictures show the rather mundane Cardiff scenery that comes with Flight Simulator 2000, our new scenery after installation in Flight Simulator 2000 and a photograph of the real Cardiff airport taken from roughly the same position.



ALSO CONSIDER

Software Title:	Airport and Scenery Designer
Publisher:	Abacus
Website:	www.abacuspub.com
Price:	£34.99
Software Title:	Airport 2.1
Publisher:	The Flight Sim Group
Website:	Download from http://simviation.com/fsdutilsdesn1.htm
Price:	FREE

REVIEW SCORE:

Publisher:	Abacus	**Price:**	£59.99 Professional £39.99 Standard
Website:	www.abacuspub.com		
Developer:	Abacus	**Release Date:**	Out Now

Pros: Provides a medium for creating spectacular scenery and new aircraft that virtually anyone can use.

Cons: Not so easy to accurately place the scenery into the Flight Simulator world.

System Requirements: Pentium 166, 32Mb RAM
Recommended: PIII 550, 128MB RAM, 16MB 3D graphics card

TUSKEGEE FIGHTERS

"Die Schwartze Vogelmenschen" (The Black Birdmen)

That Bf109 pilot is about to get a surprise

The P-51's break formation and swoop into action

THE AIRCRAFT

The AT-6C Texan

The P40 Warhawk

The beautiful P-51 Mustang

The Stearman Bi-plane

In case you missed our preview in the last issue, Tuskegee Fighters was the name given to the 332nd Fighter Group, made up entirely of African-American servicemen, who were trained at Tuskegee, Alabama to become fighter pilots during World War II. Under a regime of segregation and prejudice, these pilots showed a spirit and determination that rose above the constraints imposed by bigotry. The result was a squadron that destroyed more than 400 enemy aircraft, won over 900 decorations and didn't lose a single bomber to enemy fighters in over 1,000 missions.

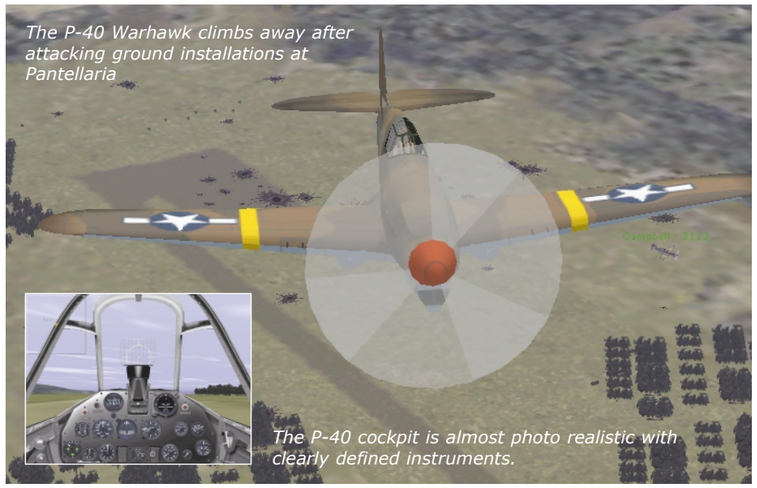
"Die Schwartze Vogelmenschen" (The Black Birdmen) was the nickname given to the Tuskegee airmen by German pilots who regarded them as very formidable adversaries. Their combat skills and outstanding courage under fire has never been equalled to this day.

The Abacus version of these events takes you back to the early 1940's with new aircraft, scenery and missions for Combat Flight Simulator, packaged as 'Tuskegee Fighters'. The scenario was created by the same team that brought us Wings over China, with aircraft from Terry Hill and Alain L'Homme, scenery by Tim Dickens and missions from the pen of Chris Steele.

After installation, the program files become part of the Combat Flight Simulator interface, where all the missions and aircraft that come with the package are selected. There are 20 new missions to choose from, ranging from the first mission against ground targets on the island of Pantellaria between Sicily and North Africa, through to escort missions

Choosing one of the new aircraft

There are 20 missions to choose from



The P-40 Warhawk climbs away after attacking ground installations at Pantellaria

The P-40 cockpit is almost photo realistic with clearly defined instruments.

More new mission areas

The briefing shows detailed maps of the new mission areas

Our P-51 seen over the Brenner pass protecting one of her charges

Oops... bang goes the Tuskegee record of never losing a plane

Very nice metallic effect on the Stearman cockpit

protecting various flights of B17 bombers. You could also provide ground support for the troops over Anzio, or join Colonel Davis in a strafing mission against some industrial targets in Austria.

The missions take place over some stunning scenery designed by Tim Dickens, covering parts of North Africa, Italy and Southern Europe. He's used elevated mesh terrain techniques in his rendition of the Alps, where simply flying the beautifully designed P-51 Mustang aircraft is a pleasure in itself. In fact, the visual rendition of the distinctive red-tailed P-51 is one of the best we've seen, with accurate fuselage markings, moving control surfaces and an authentic cockpit panel. If the model typifies the real aircraft, they must have been wonderful to fly. They're responsive, fast, stable and capable of taking on anything the Germans had to offer, including their jet fighter, the Me262, one of which was dispatched with little ceremony by yours truly, in the mission over Berlin.

Finally, the forty-five page manual includes an illustrated twenty-one page history of the Tuskegee airmen, followed by the specifications for each aircraft in the package, a list of the missions and their objectives. We highly recommend this product to all. ■

Joe Lavery

ALSO CONSIDER

Software Title:	Wings Over China
Publisher:	Abacus
Website:	www.abacuspub.com
Price:	£29.99
PC Pilot Rating:	
Software Title:	Pacific Combat Pilot
Publisher:	Just Flight
Website:	www.justflight.com
Price:	£24.99
PC Pilot Rating:	

Home safe but those flaps look a bit moth-eaten

Coming Home... that guy behind needs to get his gear down

You can take on the German WWII jet fighter, the Me262

REVIEW SCORE:

Publisher:	Abacus	**Price:**	£29.99
Website:	www.abacuspub.com	**Release Date:**	Out Now
Developer:	Abacus		

Pros: Beautifully designed aircraft and scenery, the missions are simply a bonus.

Cons: There's no pilot in the PT-17 Stearman model - we had to say something!

System Requirements: Pentium 200 , 32Mb RAM
Recommended: P III 550, 128Mb RAM, 3D graphics card

Behind Enemy Lines

The Covert War

We seem to have been inundated with Combat Flight Simulator add-ons recently, which is fine by us, you can't have too much of a good thing can you? Particularly as the latest release from Abacus called Behind Enemy Lines is a bit different from the others we've seen. It's best described as more of an ongoing adventure with an ultimate goal than the more familiar series of themed missions. It also entails a degree of planning, some precision flying, a certain amount of navigation and in some cases, accurate package dropping.

'Behind Enemy Lines' takes you back to World War II, where you're charged with flying a few critical missions for the Allies, after landing behind enemy lines. You start by completing a training mission (another first for a Combat Flight Simulator add-on) that will teach you the special skills you'll need to complete the missions. Once airborne, the radio operator will update your progress and prompt you with specific instructions as the mission proceeds.

There are two new aircraft included with the package, the first is an ultralight German SRV and the second is a Schweizer Z-32 glider, designed to get you quietly to the enemy airstrip under cover of darkness. You also have at your disposal the famous MkIX Spitfire or Messerschmitt Bf109G, depending on the side you choose to fight on. Both aircraft are fitted with a special HUD (Head Up Display) and bomb sight to help you deliver your package within the 6 degree margin of error allowed for a successful mission.

After completing the training you're ready to try one of the 30 new missions. Ranging from carrier-borne air defence patrols off the coast of Tripoli, to supporting the D-Day landings over Normandy. Incidentally, the package includes new dedicated scenery for Southern Italy and you have the option of flying either with the RAF or the Luftwaffe. If you want a more in-depth experience then you can begin one of eight new campaigns, which are compiled from the selection of missions mentioned earlier.

A successful mission brings a reward in the form of points, where the score you get is determined by the complexity of the mission and the method you adopt to complete it. For example, if you manage to fly the glider right down to the runway, carry out the mission successfully, navigate your way back to base and conclude with a textbook landing, you will achieve a perfect score of 4000 points. It's not possible to do this if you use the skip option, or start the mission with the aircraft over the target.

Abacus have managed to rejuvenate Combat Flight Simulator once again with 'Behind Enemy Lines'. It has all the ingredients of a first class add-on: new scenery, inventive new missions and campaigns that need some skill to complete, as well as value for money. ■

Joe Lavery

Check out the training mission first

Choose from the 30 new missions

Some missions begin and end on the deck of a carrier

Our Hero escaping in stolen Messerschmitt

If I close my eyes they can't see me.

Spitfire attack results in one less Heinkel for the opposition!

REVIEW SCORE:	
Publisher: Abacus	**Price:** £29.99
Website: www.abacuspub.com	**Release Date:** Out Now
Developer: Abacus	

Pros: Provides Combat Simulator with a new lease of life

Cons: Missions might be a bit implausible for some people

System Requirements: Pentium 200 MMX, 32Mb RAM
Recommended: P III 550, 128Mb RAM, 3D graphics card

Game Commander

Say it with... Words!

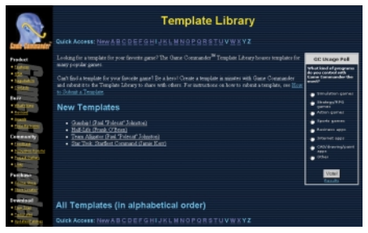
The package includes a high quality microphone from Labtec

The Game Commander interface is fairly unobtrusive

Although literally thousands of us sit for more hours than we care to admit, flying aircraft in a computer generated world, the interface we use is less than ideal for the task. Whereas a keyboard may be fine for typing on, flying aircraft requires a different type of control method, as anyone who has tried to fly a plane frantically bashing the keyboard will tell you.

There's nothing new about voice recognition and the product under review is not the first to try to use this technology to enhance our flight simulator experience. We all remember Papa Tango's (now shelved) VoiCom product, that was going to revolutionise the world of Flight Simulation. Whatever happened to that by the way?

The latest release from Mindmaker Inc. is not designed with flight simulation specifically in mind. It's intended to overcome the limitations of conventional controls and make your simulation experiences more realistic. Game Commander is basically a software control application that works through the medium of voice recognition technology. It provides voice control to all your favourite games… whoops… sorry, simulators, allowing you to issue commands or simulate multiple keystrokes by speaking into the supplied microphone. This, incidentally, is not your normal cheap and nasty microphone like that found bundled with many voice or language applications. It's a high quality headset/boom unit incorporating noise cancelling NCAT2 technology - made by Labtec and comes complete with a mute switch inline with the cable.


Template Library
Quick Access: New A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
New Templates
All Templates (in alphabetical order)
Quick Access: New A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

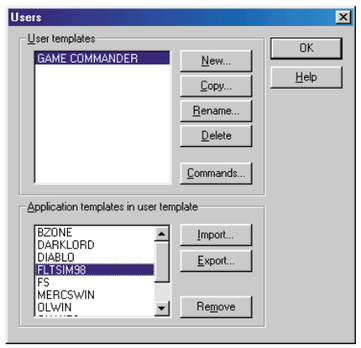
There are already hundreds of game templates free to download at the Mindmaker website

If you've used voice recognition products before, you'll be surprised to know that Game Commander requires no training. It uses a different method of recognition technology by making it speaker independent. Game Commander also comes with ready-made templates for many popular simulators, including Flight Simulator 98 and Flight Unlimited III. The idea is to use the Game Commander interface where you would normally use the keyboard, so instead of fumbling to find the gear or flaps keys on a blustery approach, you simply say "gear down" and "flaps 30", …much more civilised. Naturally, you have the facility to create your own custom templates and registered users will be able to download any new templates as they appear from the website.

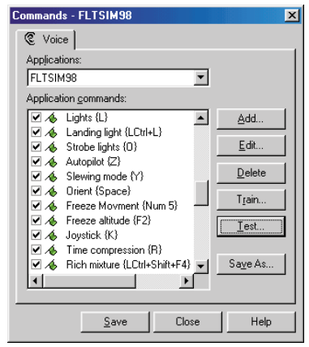
Well that's the theory. How does it work in practice? Surprisingly well as it happens, the recognition engine manages to identify the majority of words and phrases straight off and executes the command to the simulator seamlessly. Training new commands are just as easy, you simply type in the command sequence, train the system with the spoken word and save. It's that simple.

Ultimately, it's unlikely that you would use Game Commander for every command string, but when you overshoot a landing and want some instant braking or reverse thrust before ploughing into a terminal building, it's brilliant. ■

Joe Lavery



This shot shows the command sequences as programmed



You add any new application for voice control here

REVIEW SCORE:	
Publisher: Mindmaker Inc.	**Price:** $29.95
Website: www.gamecmdr.com	**Release Date:** Out Now
Developer: Mindmaker	

Pros: Offers one of the few genuinely useful external accessories for flight simulator fans.

Cons: Would be nice to integrate with an ATC controller.

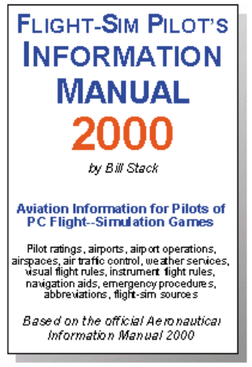
System Requirements: Pentium II 350, 64Mb RAM
Recommended: P II 550, 128Mb RAM, 16Mb 3D graphics card

Flight-Sim Pilot's Information Manual 2000

Put your PC on standby and relax with a good book

When most people think about flying they think about the co-ordination of controls, levers and switches to make an aeroplane do what they want it to. But this is only part of the story and is usually learned fairly quickly by a student pilot, who will often be soloing before reaching 10 hours flying time. A significant part of being a good pilot is a thorough knowledge of the aviation environment that you operate in and a pilot usually learns this by a combination of instruction, background reading and experience.

Those interested in making their flight simulation experience as real as possible need to know a lot more than is given in the manuals that accompany most flight simulation software. This is where Bill Stack's new book will be most useful. It gives a good overview of the non-flying aspects of aviation, so if you want to know why pilots don't always want full fuel tanks, or what to squawk when you are hijacked, this is a good place to find out.


FLIGHT-SIM PILOT'S
INFORMATION
MANUAL
2000
by Bill Stack
Aviation Information for Pilots of PC Flight--Simulation Games
Pilot ratings, airports, airport operations, airspaces, air traffic control, weather services, visual flight rules, instrument flight rules, navigation aids, emergency procedures, abbreviations, flight-sim sources
Based on the official Aeronautical Information Manual 2000

Don't judge a book by its cover

However, the production quality of the manual was a little bit disappointing, especially when compared to the booklets normally supplied with many software products. The manual is in wire bound format and the wire loops had to be eased a little to prevent the pages falling out on the review copy. The paper and print quality is also not as crisp as was expected. There is the occasional printing error, for example one table has the title on one page and the rest overleaf. Nevertheless there are 172 black and white pages of useful information and it is not an expensive manual.

Many of the topics are illustrated with clear diagrams and there are several useful tables. It covers pilot licensing, airports and their operations, airspace categories and air traffic control, weather services, visual and instrument flight rules, navigation aids and emergency procedures. There are also appendices covering the common abbreviations used in aviation, conversion tables and useful contact addresses for flight simulation.

The content of the book is based on the flying environment in the USA and is not always fully applicable to the rest of the world, including the UK. However, for those outside the USA it is all still generally appropriate and certainly close enough for simmers to immerse themselves more deeply into their simulation experience.

Flight simulation pilots who want to make their virtual flying more lifelike will find the level of detail given in the book just about right, although there are a few surprising omissions, for example VASIS (visual approach slope indicator system) is included but PAPI (precision approach path indicator) is not. The rules that apply to visual and instrument flying are put across in a clear and sensible way. The manual will also remove a good chunk of the mystique around the terminology used in flying.

If you want to know the full story of the aviation environment, you will need to buy a multitude of books and read them all. Even then, this book would provide a good overview before diving into those meaty tomes. It is a very readable manual and understanding the contents is likely to greatly improve the realism of your flight simulation experience. ■

Stephen Heyworth

Bill Stack - flight tutorial expert

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Bill Stack is an expert flight simmer, the author of numerous training manuals for flight simulation computer programs and the owner of TopSkills in the USA.

TopSkills publishes and distributes reference and self-learning books about flight simulation and other subjects. The books that cover various flight sim subjects are:

Flight-Sim Pilot's Information Manual 1999,
Instrument Flying for Flight-Simulation Pilots
Flight Sim Navigation
Flight Sim Maneuvers
and others....

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REVIEW SCORE:

Publisher:	Topskills	**Price:**	$12.95
Website:	www.topskills.com	**Release Date:**	Out Now
Book Author:	Bill Stack		

Pros: Lots of information about the aviation environment, without getting too heavy. Great background reading for simmers.

Cons: Based around the USA systems, which differ in some details to the UK. Lower than expected production quality

System Requirements:
Recommended:

DON'T TAKE OFF WITHOUT US!

Flight simulation is the most enthralling and challenging way you can use your PC. As you can see, the genre offers a bewildering array of products and ways of spending your time and money. PC Pilot is the magazine to help you decide how and what you spend your time and money on. We have tried to inform, educate and help you get more from your simulated flights and will continue to do so as we publish future editions.

PC Pilot is like no other magazine. It understands flight simulation is a hobby, not a game. It understands you want utmost realism, but that realism is more than just pretty graphics. It understands flight simmers may know a lot about aviation, but can be daunted by PC technology. PC Pilot delivers quality content issue after issue, allowing you the freedom to make an intelligent, informed choice.

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Editor

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Issue 5

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Flight Sim Training

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BEFORE YOU START

OUR FLIGHTS AND AIRPORTS

In this pair of tutorials, we will fly from Dublin, where we finished our previous flight, to Glasgow, which is about 160 nautical miles to the northeast. Both the VFR and IFR flights will take about 90 minutes.

Dublin Airport (EIDW) is a busy international airport. Officials describe it as "one of the fastest growing airports in the world." Aer Lingus and Ryanair are based there and it is used by British Airways, Delta, Lufthansa and numerous other carriers. It has two east/west runways and one northeast/southwest runway. The longest runway is 8,652 feet, and the shortest is 4,450 feet. Read about Dublin International Airport here: www.dublinairport.com

Glasgow Airport (EGPF) is the busiest of Scotland's three main international airports, with over 86,000 air transport movements serving over 6.7 million passengers a year. It is used by numerous international and regional airlines, including Aer Lingus, Air France, American Airlines, British Airways, KLM and Caledonian. The airport lies eight miles west of Glasgow, south of the river Clyde and just north of the M8 motorway. Read about Glasgow Airport here: www.baa.co.uk

You may choose which of Dublin's two parallel westward runways you would like to use for taking off. Each has slight advantages over the other. With the 240 winds, 28 would be a little better than 29. Being about a mile north of 28, runway 29 is a mile closer to Glasgow.

OUR AIRCRAFT

We'll show you how to fly the tutorial in general-aviation aircraft, then you can try it in larger, more sophisticated aircraft if you wish. So for your first flight of this tutorial, use a small general-aviation aircraft such as a Cessna 172/182, a Beechcraft Bonanza or a Mooney Bravo. All estimated times are based on a Cessna 182RG. Somewhat longer or shorter durations might apply to other aircraft.

THE CHARTS

The Jeppesen charts used for these tutorials show the respective flight paths, landmarks, airways and navigation aids. Familiarise yourself with them in advance of each flight so you won't be fumbling with them during your flights.

THE WEATHER

For both flights, we'll use typical visibility and a mild wind from the southwest. Set your visibility at ten miles, wind at five knots and direction at 240. These settings are consistent with weather reports we've been reading on the Internet lately. Before embarking on these flights, read our box about flying in winds in our previous tutorial.

For the VFR flight, we must not have any clouds in our flight path, or we cannot fly VFR. If you use clouds for your VFR flight, be sure they are at least 500 feet above our cruising altitude. For our IFR flight, we'll use overcast that blocks all views of the ground for most of the flight. Set it at no lower than 500 feet MSL and as high as you like. Also, set your IFR visibility at 5 miles to simulate light rain.

OUR FLIGHT PLANS

We will use flight plans for both our VFR and IFR flights. Each tutorial explains what should be in each flight plan. In the real world, pilots would file their flight plan with ATC. In lieu of ATC, we will imagine that we have filed in accordance with regulations. We will keep our flight plan handy throughout the flight so we can easily refer to it. After our flight, we can file it in a folder or loose-leaf notebook, or we can discard it.

For the VFR flight, we could head straight for Glasgow, but we will fly a leisurely scenic path along the Irish and Scottish coastlines to make the flight more interesting and to practice following landmarks.

MONITOR YOUR PROGRESS AND STATUS

Throughout your flights, check your instruments for the status of your aircraft and instruments. Especially monitor your engine temperature, oil pressure and fuel-flow gauges. Also check your position frequently to be sure you are on course. In the VFR flight, use ground references and time/speed/heading to track your progress. In the IFR flight, use radio navigation aids as well as time/speed/heading.

COMPENSATE FOR WIND

The winds we are using winds in these tutorials will blow your aircraft off course. Refer to the previous tutorial (issue 4) for detailed explanation of wind compensation, the wind triangle and the calculation of wind-correction headings.

KNOW HOW YOUR SIM OPERATES

How you operate your flight simulator program is up to you. Some flight simmers use common joysticks. Others use advanced flight simulator joysticks. Some of us rely entirely on the keyboard. A few flight simmers actually use yokes and rudder pedals. We assume that you know how to operate your flight simulator and you are familiar with your controls. If you are not familiar with your sim's operations and controls, familiarise yourself now and return to this flight lesson when you are ready.

FLY ONE STEP AT A TIME

We hear from many flight simmers that want to leap over the basics and challenge themselves with heavy aircraft and instrument flight right off. While this is a great luxury of flight simulation, it deprives simmers of the skills they need for meeting their advanced challenges. When trying to meet challenges, for which they are unprepared, flight simmers frustrate themselves with poor performance such as sloppy landings and even crashes. So we strongly advise doing everything one step at a time and building your skills toward the next levels.

USE THESE TUTORIALS FOR FLIGHT-SIMMING, ONLY

These tutorials are intended for computer flight-simulation, not for real-world aviation or flight training. While making our tutorials as realistic as feasible, we have adapted them out of necessity to the limits and nuances of flight simulation, so some aspects cannot and do not apply to real-world flight. Therefore, we caution everyone to use these tutorials for their intended purposes, and we accept no liability for anybody's misuse of them.

REFER TO OUR PRIOR TUTORIALS

For space considerations, we will not repeat common aspects in every tutorial. If you don't have our previous tutorials, back issues are available direct from us over the telephone or through our web site at www.pcpilot.net

OUR AUTHORS

Bill Stack is an expert flight simmer and author of several popular flight simulator books. Nels Anderson, technical consultant, is a certified pilot, renowned flight simmer and president of www.flightsim.com

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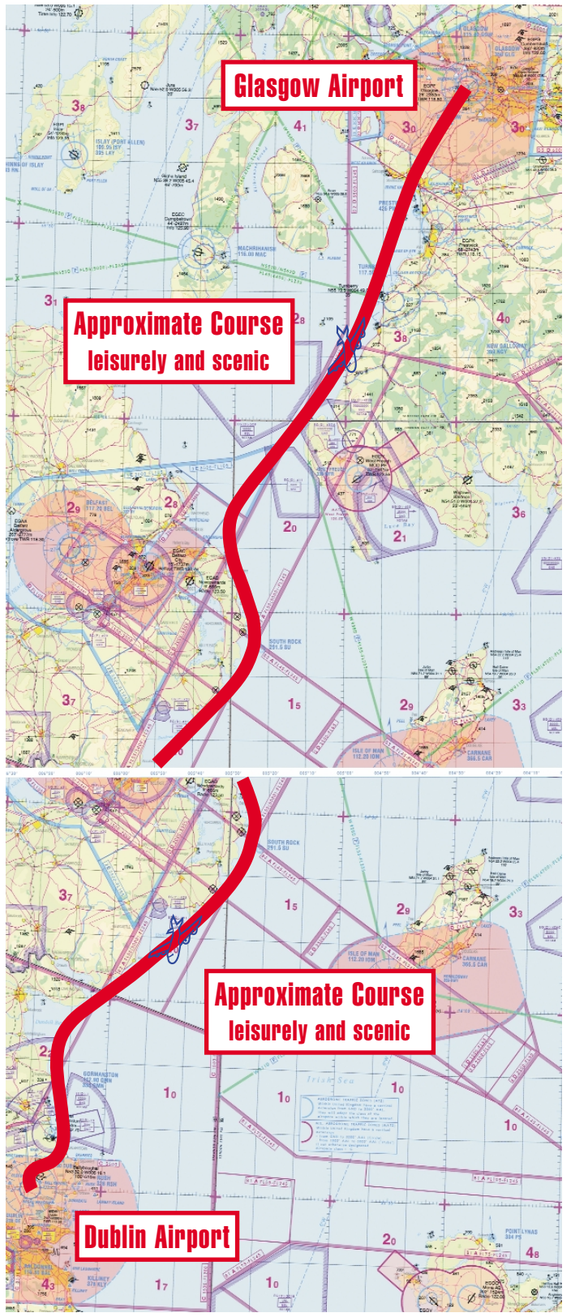
VFR (Visual Flight Rules) Tutorial

Part 5

Along the Irish and Scottish coasts to Glasgow using pilotage and dead reckoning



Source: Jeppesen EG-3 & EG-4. Red notations by PC Pilot. For flight simulator use only

Pilot: PC Pilot — Flight-Sim Flight Plan — Date:

Flight Rules (circle one)	Aircraft Type	True Airspeed	Departure Time	Cruising Altitude	Arrival Time
VFR / IFR	Single engine	140 kts		5,000 MSL	

Flight Route

Landmarks	Navaids & Frequencies	Headings *	Distances	Durations
Depart Dublin, Ireland		030	10 nm	5 min
Coastline north of Dublin, Ireland		010	20 nm	9 min
Dundalk Bay, Ireland		050	20 nm	9 min
Dundrum Bay, Ireland		050-330	40 nm	17 min
Belfast Bay, Ireland		055	20 nm	9 min
Corsewall Point, Scotland		055-040	35 nm	15 min
Prestwick, Scotland		035-040	5 nm	2 min
Cross Scottish coastline		030	20 nm	9 min
Glasgow Airport		Join pattern		5 min
			170 nm	80 min

* Adjust headings for winds

Origin Airport	Destination Airport	Alternate Airport (IFR only)	Estimated Duration
Name: Dublin EIDW	Name: Glasgow EGPF	Name:	80 min
Elevation: 242	Elevation: 26	Elevation:	Fuel Needs
ATIS: 124.52	ATIS: 129.57	ATIS:	40 gallons
Tower or Departure: 121.8	Tower or Arrival: 119.1	Tower or Arrival:	

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This leisurely flight from Dublin to Glasgow will give us plenty of beautiful scenery to enjoy over Ireland and Scotland. We will use some pilotage along the coastlines and some dead reckoning over water. We can use radio navigation aids if we choose, but we will not need to. You will learn how to reach your destination, track your progress and know your positions by relying solely on visual references outside your aircraft and timing your durations between points.

EMBARK ON YOUR EN ROUTE FLIGHT

Jot down the time when you take off, and keep track of time during your flight. Take off as normal from your chosen runway. Once you reach 1,200 feet MSL, which is about 1,000 feet AGL at Dublin, make two course changes. (1) Change your climb rate to 500 feet per minute if it has been more than that. (2) Turn right at a steady 20-degree bank and head 030 degrees.

After these changes, continue climbing to our cruising altitude of 5,000 feet above MSL (mean sea level). This altitude will be low enough so we can easily see ground references, high enough for good downrange visibility and consistent with required cruising levels in UK controlled airspace. Most of our flight will be over water, and we won't fly over any high land areas, so this will be a safe altitude. You can use elevator trim or autopilot to maintain our cruising altitude.

Pilots would normally notify Dublin tower that they are leaving the airport's airspace, then contact en route ATC.

About eight minutes after taking off, we will pass over the coastline.

When you get there, turn left and head along the coast just east of it so you are flying over water with land visible to your left. Our desired course will be about 010 for this leg, and a slight heading adjustment will be needed to compensate for the 240 wind. You will need to crab your aircraft a bit for wind compensation, because the 240 wind will push you away from land.

Five or six minutes later, we will reach the mouth of Dundalk Bay. Turn right and head 050. This course will keep us just southeast of the coast of Ireland. For a while, we will have a tail wind. In nine or ten minutes we will pass Dundrum Bay. In another five or six minutes, the coastline will curve off toward the left. Alter your course enough to keep parallel with the curving coastline.

By the time you reach the mouth of Belfast Bay, your heading should be about 330 to 340. In the distance to the left, you

should see the Belfast urban area and some highlands. Turn right and

head 035. You will now fly across the Irish Sea to Corsewall Point in southern Scotland. This 20-mile leg over water will last about eight or nine minutes. We will have a tail wind for the remainder of our flight to Glasgow.

Once you reach Corsewall Point, adjust your course so that you fly along to the west of the Scottish coastline. Water will be to your

left and land to your right. Your heading will generally be 035 to 040, and you will adjust your heading as necessary to keep over water just west of the Scottish coast.

After following the coastline for about 15 minutes, you should see the Prestwick urban area and Prestwick Airport to your right. Your marker beacon indicator might sound as you pass over the airport's instrument approach system. Soon thereafter, the coastline will curve westward and across your path. You are only about 20 miles and about ten minutes from Glasgow. We won't follow the coastline any more, so change your heading to 030, which will bring you straight to Glasgow airport.

BEGIN APPROACHING GLASGOW AIRPORT

After passing over the coastline and beginning your overland leg to Glasgow, reduce airspeed and begin a 500 foot-per-minute descent to 2,000 MSL. Glasgow Airport's elevation is 26 feet, and there are some highlands between the coast and Glasgow.

Roads leading to Glasgow will appear ahead of you, and the city's urban area will soon appear in the distance straight ahead.

As soon as you begin descending, tune into ATIS for general information at 129.57. Then contact Glasgow approach at 119.10 and announce your intentions to land there, or simulate this contact yourself. ATC manages this busy commercial airport strictly. In lieu of ATC vectoring and clearance in our simulators, we will adhere to a standard airport traffic pattern.

Adjust the aircraft for the changing air density and new flight phase: (1) Fuel mixture rich, (2) propeller RPM high, (3) landing lights on, (4) carburettor heat on and (5) altimeter consistent with local weather report.

JOIN THE AIRPORT TRAFFIC PATTERN

You should see Glasgow Airport straight ahead five or six minutes after passing the coastline. When you see it, descend to 1,000 MSL, which is about 1,000 AGL, and join the traffic pattern for runway 23.

Because of the 240 wind, Glasgow's 23 is ideal for a headwind landing. Join its traffic pattern as described in our first two tutorials and land normally. As you pass by Glasgow Airport on your downwind leg, you will fly over the western suburbs of Glasgow, and you should see the Glasgow urban area to your right. Depending on how far past the airport you fly for your pattern, you might fly over Glasgow's River Clyde, too. Be sure to maintain your altitude in this area to avoid striking the high terrain around the city.

LAND AT GLASGOW

Refer to the Landing in Winds box (in Issue 4) for the most common methods for landing in winds. For these tutorials, the winds will be nearly a full headwind.

CONGRATULATIONS!

You have just navigated about 175 miles by using pilotage and a little dead reckoning. For more of a challenge, fly this route again with stronger winds and/or a more sophisticated aircraft.

PC Pilot Tutorials are officially approved by TopSkills

Bill Stack is an expert flight simmer, the author of numerous training manuals for flight simulation computer programs and the owner of TopSkills in the USA. TopSkills publishes and distributes reference and self-learning books about flight simulation and other subjects.

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Flight Sim Navigation

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and others....

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Nels Anderson, technical advisor for these tutorials, is a general aviation pilot and president of www.flightsim.com

IFR (Instrument Flight Rules) Tutorial

Part 5

Dublin to Glasgow utilising Fixes, Holds and Procedure Turns

This 160-mile, 90-minute instrument flight from Ireland to Scotland requires three new challenges: navigating with fixes, flying a holding pattern and executing a procedure turn. You will learn to use these fixes and fly these procedures with total reliance on your aircraft and navigation instruments.

Our flight plan reflects our flight path. Normally, pilots would make their flight plans in duplicate, submit a copy to ATC and use their original in the cockpit. In lieu of ATC, we will make one flight plan, use it during our flight and file it after our flight in a folder or loose-leaf binder.

Avoid using GPS (Global Positioning System) with this tutorial, at least on your first flight, so you can practice locating fixes by VOR triangulation. We will explain GPS in the next tutorial, but you are welcome to try using GPS on this one after your first flight.

READ YOUR CHARTS

The charts show our route from Dublin to Glasgow as well as instrument procedures for using each airport.

Departure. The standard instrument departure (SID) chart for northerly departures from Dublin calls for aircraft to fly north to the Dublin VOR, then to fixes that must be triangulated from two VORs.

En route. The en route chart shows the airways, navigation aids and fixes we will use from just after leaving Dublin to just before arriving at Glasgow. The path is fairly straight and uncomplicated from city to city.

Arrival. The instrument approach procedure (IAP) chart shows the procedures we will use between our en route portion and our landing at Glasgow. It includes the holding pattern and the procedure turn.

Familiarise yourself with all relevant aspects of these charts before taking off so you won't have to fumble around in the aircraft trying to figure them out.

Note that some of the instrument procedure charts are not to scale, so the courses depicted on them are not precisely drawn. On these charts, follow the textual directions and use the graphical depictions for comprehension only.

SET YOUR RADIOS AND GAUGES

Set your radios and gauges for the frequencies you will need as shown on the charts: (A) Dublin VOR (DUB) 114.9, and Belfast VOR (BEL) 117.2. If your radios

Pilot: PC Pilot — **Flight-Sim Flight Plan** — Date:

Flight Rules (circle one)	Aircraft Type	True Airspeed	Departure Time	Cruising Altitude	Arrival Time
VFR (IFR)	Single engine	140 kts		7,000 MSL	

Flight Route

Landmarks	Navaids & Frequencies	Headings	Distances	Durations
	Dublin SID (GELKI 2B)	As shown	45 nautical miles	18 minutes
	B2 Airway			
	MULLA fix	052	13 nm	6 min
	RIMGA fix	052	14 nm	6 min
	BLACA fix	052	32 nm	14 min
	Turnberry VOR (TRN) 117.5	058	29 nm	13 min
	Glasgow STAR TRN A	As shown	47 nm	20 min
	Glasgow IAP VOR/DME Rwy 23	As shown	45 nm	19 min
	Glasgow Airport		223 nm	96 min

Origin Airport	Destination Airport	Alternate Airport (IFR only)	Estimated Duration
Name: Dublin EIDW	Name:	Name: Edinburgh (EGPH)	100 min
Elevation: 242	Elevation:	Elevation: 135	Fuel Needs
ATIS: 124.52	ATIS:	ATIS: 115.7	60 gallons
Tower or Departure: 118.6	Tower or Arrival:	Tower or Arrival:	

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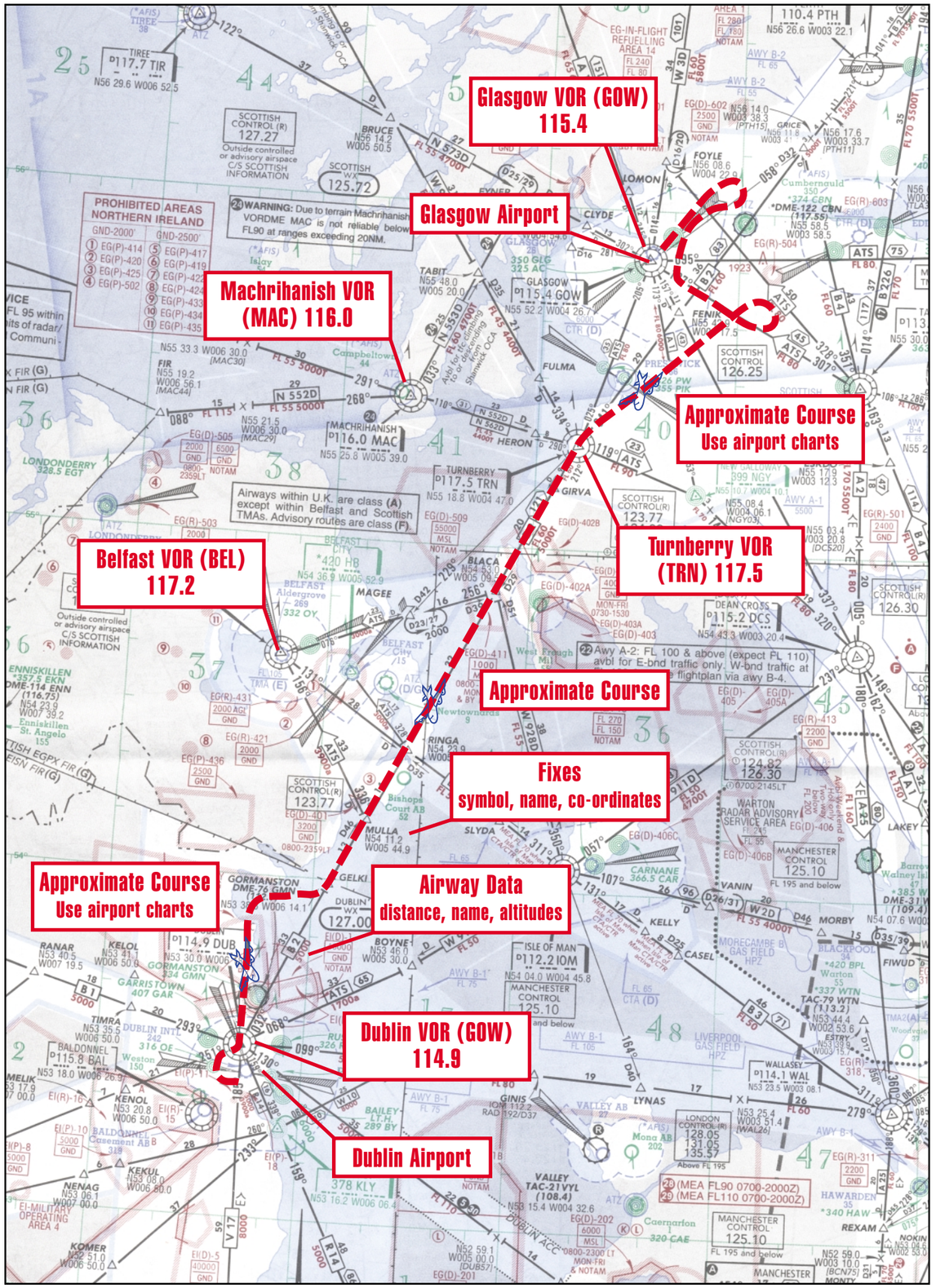
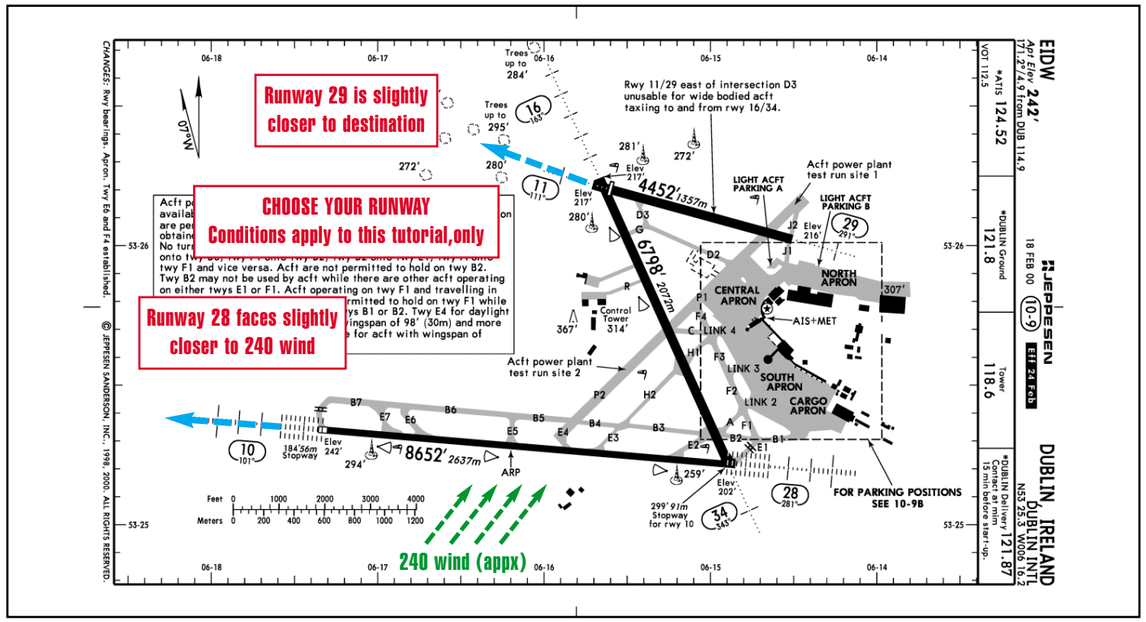


This is the route we shall take on our flight from Dublin to Glasgow



Dublin Airport Diagram

enable the setting of standby frequencies, enter Turnberry VOR (TRN) 117.5 and Machrihanish (MAC) 116.0. Otherwise, be prepared to enter these frequencies when necessary.

Set your OBI for 063, because that's the heading you will use to intercept Dublin VOR right after you take off.

Be sure your altimeter is properly set for local barometric pressure. Precisely following this SID requires us to be where we should be when we should be there. Even a slight altimeter error can make us believe we are enough above or below our actual altitude to create real problems for other aircraft using the airspace - aircraft we cannot see and who cannot see us because of the low-visibility weather conditions that mandate our instrument flight.

TAKE OFF NORMALLY

Take off as normal, including cockpit preparation and appropriate ATC clearances, as explained in our previous tutorials. For space considerations, we will not repeat aspects in each tutorial. Read the previous tutorial about taking off in winds for additional information.

The SID requires pilots to contact Dublin Control immediately after taking off. The frequency, 129.17, is shown on the SID. Make or simulate this contact just after taking off.

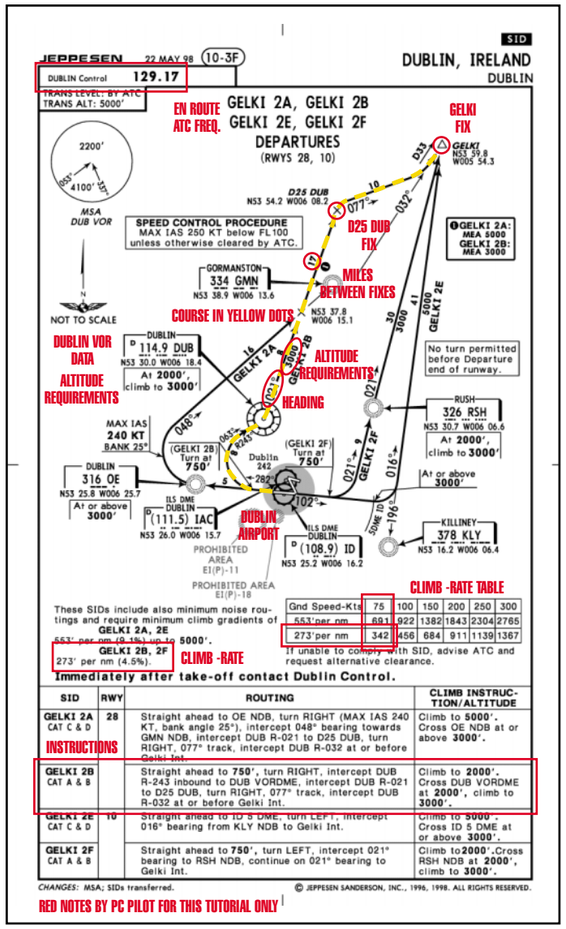
DEPART DUBLIN

Notice on the SID that the procedure is a bit curious. Instead of joining airway B2 that intersects Dublin VOR and leads to Glasgow, we fly west of that airway then join it about 25 miles north of Dublin VOR. SIDs are designed to control traffic in and out of busy airports and minimise noise on the ground in the surrounding area, which explains why they aren't always the most obvious routes.

We will use the GELKI 2B departure procedure. It will enable us to track from Dublin VOR, and the comparatively sharp turn is easily achievable in our general-aviation aircraft. After taking off, follow the climb-gradient and turn guidance carefully.

GELKI 2B departure calls for a climb gradient of 4.5 percent, or 273 feet altitude for every nautical mile downrange. The table on the SID chart shows that at climb airspeeds between 75 knots and 100 knots, which fits the general aviation aircraft we will fly, a 273 per nm climb gradient is achieved by a vertical climb speed of no less than 342 feet per minute. This system is a bit confusing, although it makes perfect sense. A standard foot-per-minute vertical climb speed would not work for all aircraft that use this airport because of their various climb-out airspeeds.

GELKI 2B also calls for beginning the right turn at 750 MSL and


SID
JEPPESEN 22 MAY 98 10-3F
DUBLIN, IRELAND
DUBLIN
DUBLIN Control 129.17
TRANS LEVEL: BY ATC
TRANS ALT: 5000'
EN ROUTE ATC FREQ.
GELKI 2A, GELKI 2B
GELKI 2E, GELKI 2F
DEPARTURES
(RWYS 28, 10)
GELKI FIX
D25 DUB FIX
MILES BETWEEN FIXES
COURSE IN YELLOW DOTS
ALTITUDE REQUIREMENTS
HEADING
DUBLIN VOR DATA
ALTITUDE REQUIREMENTS
DUBLIN AIRPORT
SPEED CONTROL PROCEDURE
MAX IAS 250 KT below FL100 unless otherwise cleared by ATC.
MAX IAS 240 KT BANK 25°
No turn permitted before Departure end of runway.
CLIMB -RATE TABLE
Gnd Speed-Kts 75 100 150 200 250 300
553' per nm 691 922 1382 1843 2304 2765
273' per nm 342 456 684 911 1139 1367
CLIMB -RATE
INSTRUCTIONS
Immediately after take-off contact Dublin Control.
SID RWY ROUTING CLIMB INSTRUC-TION/ALTITUDE
GELKI 2A CAT C & D 28 Straight ahead to OE NDB, turn RIGHT (MAX IAS 240 KT, bank angle 25°), intercept 048° bearing towards GMN NDB, intercept DUB R-021 to D25 DUB, turn RIGHT, 077° track, intercept DUB R-032 at or before Gelki Int. Climb to 5000'. Cross OE NDB at or above 3000'.
GELKI 2B CAT A & B Straight ahead to 750', turn RIGHT, intercept DUB R-243 inbound to DUB VORDME, intercept DUB R-021 to D25 DUB, turn RIGHT, 077° track, intercept DUB R-032 at or before Gelki Int. Climb to 2000', Cross DUB VORDME at 2000', climb to 3000'.
GELKI 2E CAT C & D 10 Straight ahead to ID 5 DME, turn LEFT, intercept 016° bearing from KLY NDB to Gelki Int. Climb to 3000'. Cross ID 5 DME at or above 3000'.
GELKI 2F CAT A & B Straight ahead to 750', turn LEFT, intercept 021° bearing to RSH NDB, continue on 021° bearing to Gelki Int. Climb to 2000',Cross RSH NDB at 2000', climb to 3000'.
CHANGES: MSA; SIDs transferred.
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RED NOTES BY PC PILOT FOR THIS TUTORIAL ONLY

The standard instrument departure (SID) for Dublin's runways 28 and 10

crossing Dublin VOR along its 063/243 radial. The necessary bank angle will vary depending on your airspeed and whether you took off from 29 or 28. The faster you travel, the sharper the bank you will need. If you take off from 29, a sharper bank will be needed because you'll be closer to the VOR and vice versa. We found that a mild bank of 5 degrees was adequate, but you will probably find that somewhat more or less than this will bring you to DUB's 063 radial while you're executing the turn. Climb no higher than 2,000 MSL until you reach DUB.

As soon as you reach DUB, turn left, head 021 from DUB, track your progress along its 021/201 radial, climb to 3,000 MSL and maintain that altitude until the next fix. Be absolutely sure you are tracking along this radial so you can arrive at the next fix (D25 DUB). If you drift off this radial, which is likely with your 240 wind, you will not arrive at the fix and your flight will be inconsistent with the prescribed departure procedure.

The fix D25 DUB is 25 miles DME from DUB VOR along its 021 radial. Its precise co-ordinates are shown on the chart, but you won't need them unless you're using GPS. We ask you to not use GPS so you can learn and practice triangulation. Feel free to use GPS after you feel comfortable with your triangulation. You should reach this fix about ten minutes after passing DUB.

When you reach D25 DUB, turn right and head 077 toward the final departure fix, GELKI. It is 33 miles DME from DUB on its 032 radial. The chart shows that we don't actually intercept GELKI on a 077 heading but turn and intercept GELKI at 032. So when you intercept the 032 radial of DUB, turn left and head 032 toward GELKI. The chart also shows that GELKI is 10 miles from D25 DUB, so this portion should take about four minutes.

JOIN THE AIRWAY

Once you pass GELKI, you have completed the Dublin SID and will join the B2 airway. Climb to our cruising altitude of 7,000 MSL and maintain it until you reach Glasgow. You can use elevator trim or autopilot to maintain your cruising altitude. Adjust your propeller pitch and fuel mixture for your cruising altitude. Use Pitot heat if temperatures are cold.

PLOT YOUR POSITION

During your flight from Dublin to Glasgow, be sure to maintain your track along DUB's 032 radial, plot your position frequently and adjust your heading as necessary to stay on course. The 240 tail wind will push us forward and slightly toward the right for most of this flight. This means that our ground speed will be about five knots faster than otherwise, and wind compensation will be necessary. Read our previous tutorial about the wind triangle for guidance.

The length of this leg from GELKI to TRN is 88 miles and it will take about to 35 to 40 minutes, depending on your ground speed. Remember that your 240 wind will increase your ground speed by about five knots. During this leg, you will maintain your heading except for corrections to hold your course.

For nearly three-quarters of an hour you won't have much to do but monitor your navigation instruments and keep an eye on your aircraft's status. This is what real-world pilots are talking about when they say instrument flying is 90 percent boredom and 10 percent frenzy. For those simmers that want supreme flying challenges, maintaining your attention during this uninteresting aspect of instrument flight is actually very challenging. Lose attention, and you can find yourself off course and scrambling to get back on course. Besides, the STAR and IAP at Glasgow will compensate for any boredom you might experience en route!

Several fixes along the route are important. MULLA is at the interception of DUB's 032/212 radial and BEL's 156/336 radial and 46 miles from DUB. When you intercept BEL's 156/336 radial, you will be at MULLA. The chart shows it 13 miles from GELKI, so this will take about five minutes. RINGA is similarly at BEL's 132/312 radial. At 14 miles from MULLA, this will take another five minutes. Somewhere between here and the next fix, you will need to track toward TRN instead of from DUB, because you will be out of DUB's range. BLACA is at BEL's 077/257 radial and 29 miles from TRN. GIRVA is nine miles from TRN. Getting to GIRVA will take about eight minutes, and getting from GIRVA to TRN will take another three or four minutes.

You can use BEL any time to determine your position along this course. Simply take BEL's reading from your OBI, then plot it on your chart from BEL. For example, if your OBI shows you 090 from BEL, you are over the middle of the Irish Sea between Ireland and Scotland.

When you reach TRN, you will be 35 miles and about 14 minutes from Glasgow. However, you won't be on the ground in 14 minutes. The whole instrument approach procedure, including the STAR and the IAP, will cover about 90 miles, so we won't be on the ground for another 30 or more minutes.

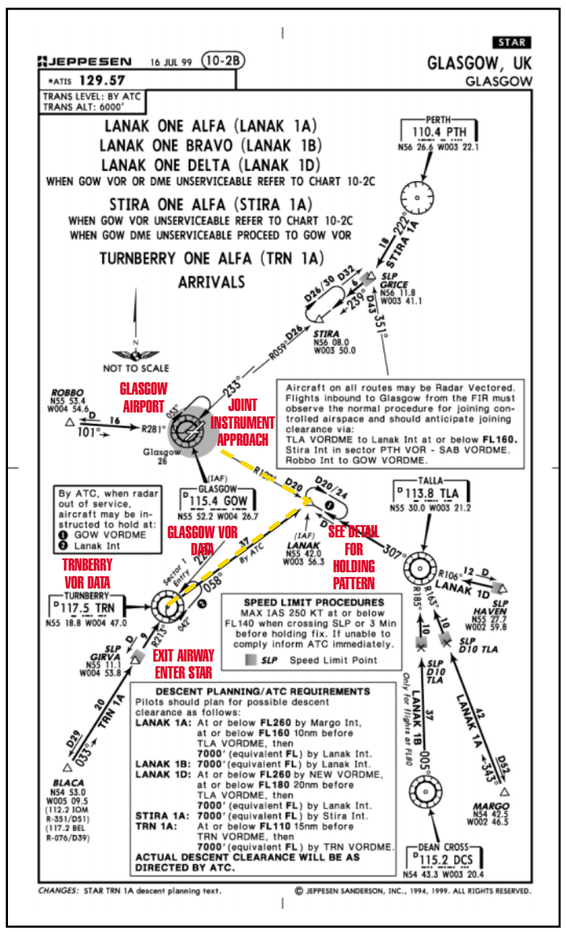
EXIT THE AIRWAY, JOIN THE GLASGOW STAR (STANDARD TERMINAL ARRIVAL ROUTE)

When you reach TRN, exit the airway and join the STAR for southern arrivals. The only traffic that would follow the airways directly to GOW would be those aircraft that are passing through to another destination. Pilots would normally notify ATC en route that they are leaving the airway, then contact Glasgow approach.

As soon as you reach TRN, join the STAR by turning right to a heading of 058 and head for LANAK. This fix is 37 miles from TRN, so getting there will take about 15 minutes.

The chart states that descents are directed by ATC, and the table shows minimum entry altitudes of 7,000. From there, ATC tells pilots what altitudes to fly during this STAR. In lieu of ATC, we will maintain our 7,000 MSL altitude and descend later. Being more than 20 miles from Glasgow airport, we will have plenty of time for descending. Adjust your altimeter for local conditions according to Glasgow's ATIS.

LANAK is 20 miles from Glasgow VOR (GOW) 115.4 and at the intersection of its 127/307 radial and TRN's 058/238 radial. So continue on your 058 heading from TRN until you intercept GOW's 127/307 radial, and your DME should show you at 20 miles from GOW. Once you reach LANAK, use GOW for guiding you through this STAR.


STAR
JEPPESEN 16 JUL 99 10-2B
GLASGOW, UK
GLASGOW
*ATIS 129.57
TRANS LEVEL: BY ATC
TRANS ALT: 6000'
LANAK ONE ALFA (LANAK 1A)
LANAK ONE BRAVO (LANAK 1B)
LANAK ONE DELTA (LANAK 1D)
WHEN GOW VOR OR DME UNSERVICEABLE REFER TO CHART 10-2C
STIRA ONE ALFA (STIRA 1A)
WHEN GOW VOR UNSERVICEABLE REFER TO CHART 10-2C
WHEN GOW DME UNSERVICEABLE PROCEED TO GOW VOR
TURNBERRY ONE ALFA (TRN 1A)
ARRIVALS
PERTH 110.4 PTH
GLASGOW AIRPORT
JOINT INSTRUMENT APPROACH
Aircraft on all routes may be Radar Vectored. Flights inbound to Glasgow from the FIR must observe the normal procedure for joining controlled airspace and should anticipate joining clearance via:
TLA VORDME to Lanak Int at or below FL160.
Stira Int in sector PTH VOR - SAB VORDME.
Robbo Int to GOW VORDME.
By ATC, when radar out of service, aircraft may be instructed to hold at: GOW VORDME, Lanak Int
GLASGOW VOR DATA
TRNBERRY VOR DATA
EXIT AIRWAY ENTER STAR
SEE DETAIL FOR HOLDING PATTERN
SPEED LIMIT PROCEDURES
MAX IAS 250 KT at or below FL140 when crossing SLP or 3 Min before holding fix. If unable to comply inform ATC immediately.
SLP Speed Limit Point
DESCENT PLANNING/ATC REQUIREMENTS
Pilots should plan for possible descent clearance as follows:
LANAK 1A: At or below FL260 by Margo Int, at or below FL160 10nm before TLA VORDME, then 7000' (equivalent FL) by Lanak Int.
LANAK 1B: 7000' (equivalent FL) by Lanak Int.
LANAK 1D: At or below FL260 by NEW VORDME, at or below FL180 20nm before TLA VORDME, then 7000' (equivalent FL) by Lanak Int.
STIRA 1A: 7000' (equivalent FL) by Stira Int.
TRN 1A: At or below FL110 15nm before TRN VORDME, then 7000' (equivalent FL) by TRN VORDME.
ACTUAL DESCENT CLEARANCE WILL BE AS DIRECTED BY ATC.
TURNBERRY VOR/DME N55 18.8 W004 47.0 117.5 TRN
BLACA N54 53.0 W005 09.5 (112.2 IOM R-351/D51) (117.2 BEL R-076/D39)
GIRVA N55 11.4 W004 53.8
ROBBO N55 53.4 W004 34.6
GLASGOW VOR/DME N55 52.2 W004 26.7 115.4 GOW
LANAK N55 42.0 W003 56.3
TALLA N55 30.0 W003 21.2 113.8 TLA
STIRA N56 08.0 W003 50.0
GRICE N56 11.8 W003 41.1
DEAN CROSS 115.2 DCS N54 43.3 W003 20.4
MARGO N54 42.5 W002 46.5
HAVEN N55 27.7 W002 59.8
CHANGES: STAR TRN 1A descent planning text.
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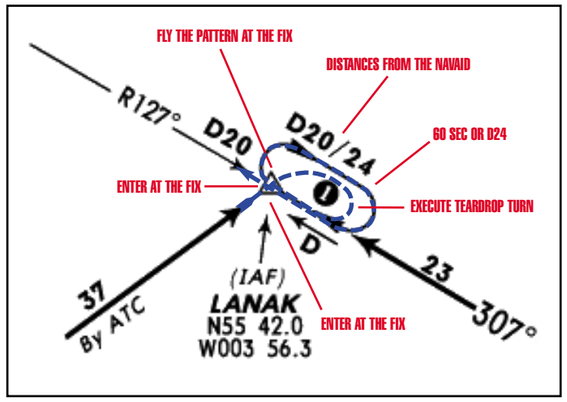
Southern Arrivals - STAR (Standard Terminal Arrival Route) for Glasgow airport



Holding pattern at LANAK with a standard 60 second holding pattern and turn

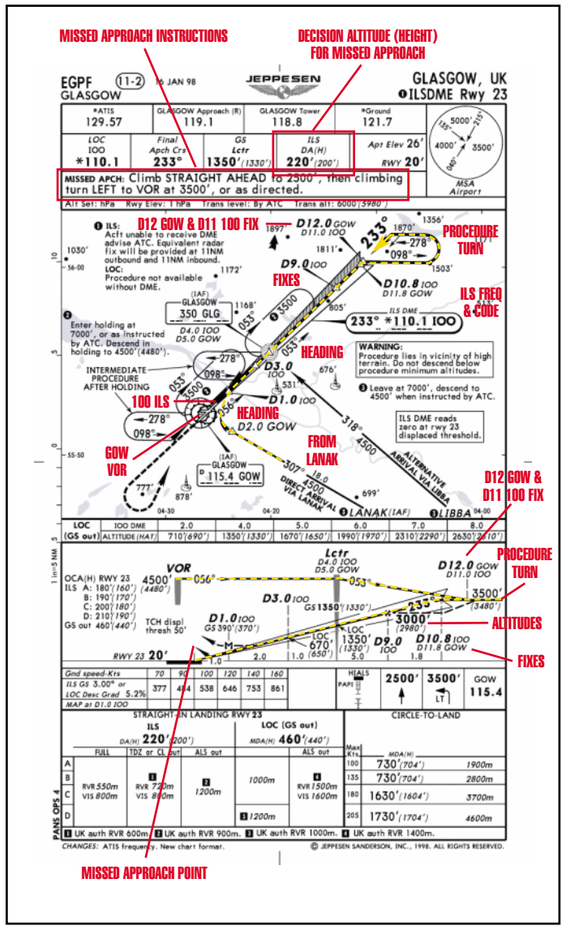
FLY THE HOLDING PATTERN

At LANAK, enter the holding pattern with a typical teardrop turn. Head 30 degrees from the pattern's holding side (which heads from the ultimate destination). This pattern's holding side heading is 127, so head 097 into the pattern. After a minute, turn right at a standard rate until your heading is 307. A standard-rate turn completes 180 degrees in two minutes, and it will show the aeroplane symbol in your turn co-ordinator aligned with the L or R as applicable. Upon exiting this turn, you should be heading 307 and straight for GOW along its 127/307 radial. If not, adjust your course as needed.

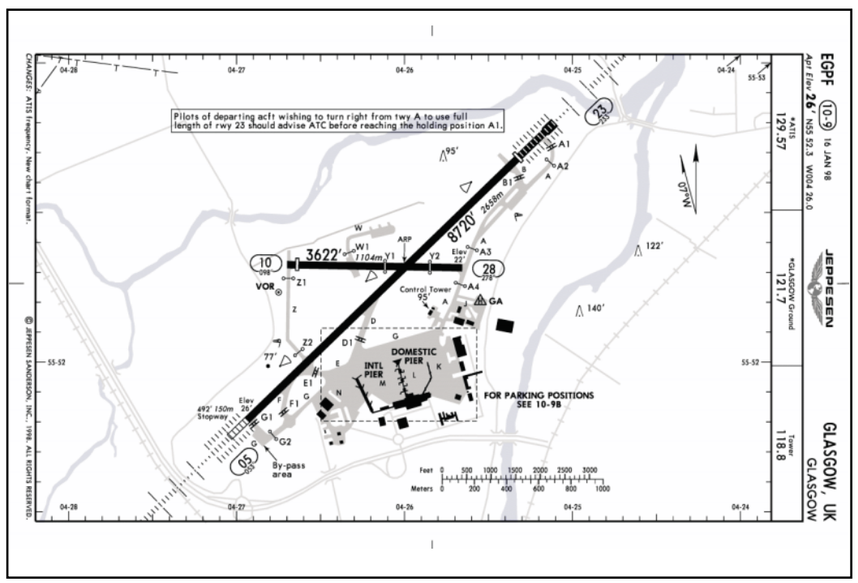
When you reach LANAK again, which is 20 miles from GOW, turn right 180 degrees at a standard rate and head 127 until reaching the opposite end of the pattern. Normally, this leg is 60 seconds. On this pattern, this leg is 60 seconds or D24 GOW (24 miles from GOW), whichever is reached first. Then execute another 180-degree standard-rate turn and head back for GOW at 307.

Holds are more complicated than this, but we lack the space for a detailed explanation. Consult the detailed drawing for additional information.

If you were using your autopilot to maintain altitude, disengage it now and use your elevator trim for the remainder of the procedure.


MISSED APPROACH INSTRUCTIONS
DECISION ALTITUDE (HEIGHT) FOR MISSED APPROACH
EGPF GLASGOW
JEPPESEN
GLASGOW, UK
ILSDME Rwy 23
MISSED APCH: Climb STRAIGHT AHEAD to 2500', then climbing turn LEFT to VOR at 3500', or as directed.
D12 GOW & D11 IOO FIX
PROCEDURE TURN
FIXES
ILS FREQ & CODE
233° *110.1 IOO
HEADING
WARNING: Procedure lies in vicinity of high terrain. Do not descend below procedure minimum altitudes.
INTERMEDIATE PROCEDURE AFTER HOLDING
IOO ILS
GOW VOR
FROM LANAK
ILS DME reads zero at rwy 23 displaced threshold.
D12 GOW & D11 IOO FIX
PROCEDURE TURN
ALTITUDES
FIXES
MISSED APPROACH POINT

Instrument Landing procedure into Glasgow's runway 23


EGPF GLASGOW
JEPPESEN
GLASGOW, UK
Pilots of departing acft wishing to turn right from twy A to use full length of rwy 23 should advise ATC before reaching the holding position A1.
DOMESTIC PIER
INTL PIER
FOR PARKING POSITIONS SEE 10-9B
By-pass area

Glasgow Airport Diagram

EXIT THE STAR, JOIN THE INSTRUMENT APPROACH PROCEDURE

When you reach LANAK the second time, after completing one loop on the holding pattern, consider that ATC has released you from the hold, and exit by continuing toward GOW along its 127/307 radial. Also, descend to 4,500 MSL and join the ILS/DME instrument approach procedure for runway 23. We will use 23 because of the 240 wind. Be sure to adjust your propeller and mixture for the lower altitude.

The IAP chart shows a right turn, then a course and altitude change, then a procedure turn before intercepting the ILS localiser and glide slope. It also warns pilots to maintain prescribed altitudes because of high terrain in the area, which it identifies. If you flew the corresponding VFR tutorial to Glasgow, you saw that high terrain in the area. The chart also pinpoints towers and buildings in the area.

At D2, which is two miles from GOW, turn right and intercept the 056 radial from the airport.

At D4, which is four miles from GOW, head 053 and descend to 3,500 MSL. Be sure to adjust your propeller and fuel mixture for your lower altitude. Although the chart doesn't call for speed reductions, reducing your airspeed to 120 or 110 knots, depending on your aircraft, will make the upcoming turns easier and help you get ready for your landing.

At D12 GOW and D11 IOO, execute a procedure turn. This is the same point with two references. One reference is from GOW, and the other is from the ILS signal IOO (110.1). This fix is 12 miles from GOW and 11 miles from runway 23's threshold. For the early part of the approach procedure, using GOW makes sense, then using IOO makes sense later.

Execute your procedure turn as follows: Head 098 for 60 seconds, then reverse course with a 180-degree standard-rate left turn and head 278. The chart doesn't specify the type of procedure turn, and this 60-second timing will give you room for error. It's also an ideal moment to tune in the ILS localiser and glide slope IOO at 110.1 then use it for the remainder of the procedure. Just before your OBI needle reaches the centre, which indicates that you are about to intercept the localiser, turn left and head 233 toward the runway.

Follow the ILS localiser and glide slope to the runway as explained in previous tutorials and land normally. After landing, exit the runway promptly.

MISSED APPROACH?

A missed approach is necessary if your position is not favourable for landing. According to the chart, the runway should be visible from 220 MSL along the glide slope. At this airport, that's only 200 feet above the ground! This is partly what precision approach is about —a decision altitude could not safely be this close to the ground on VOR or NDB approaches. Also, your aircraft should be within 30 degrees from the runway centreline. If you've followed the localiser, this should not be a problem. Do not force a landing from a bad position, as it will invite a hard landing or a crash.

The chart explains and shows how to execute a missed approach here if necessary. Power up and climb straight ahead to 2,500 MSL. Then turn left and simultaneously climb to 3,500 MSL and return to GOW. Then notify ATC for instructions. In lieu of ATC instructions, repeat the IAP by heading 053 from GOW at 3,500 MSL to D11 IOO, executing the procedure turn again and so forth. The heavy dotted line with arrow south of the airport is the missed approach path, and the instructions are written in the upper part of the chart.

CONGRATULATIONS

You have successfully flown en route from one airport to another using an airway, several fixes and several VORs. You have also executed a simple hold and a procedure turn. And you have done all this with a mild wind. Well done, indeed!

Keep flying this tutorial to build your proficiency. Apply stronger winds and turbulence and advance to more sophisticated aircraft to make it more challenging if you like.

For more information about instrument flying, read Bill Stack's Instrument Flying for Flight-Sim Pilots - available from www.topskills.com/flitsim.htm ■

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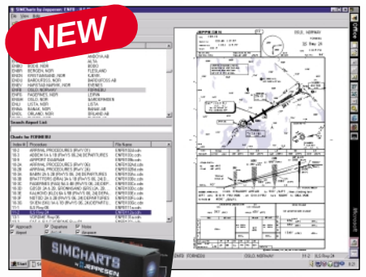
Jeppesen SIMCharts



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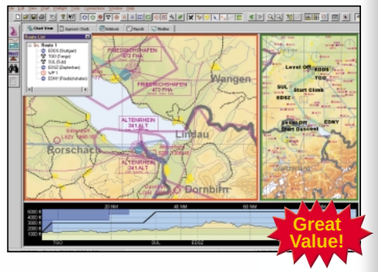

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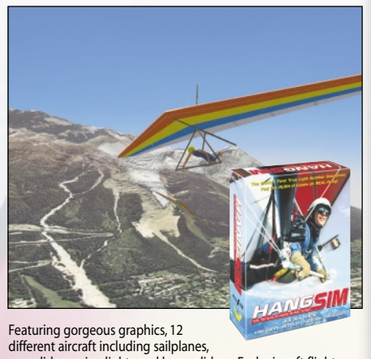
Hang Glider Simulator



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PROCESSOR MELTDOWN!

Unscrambling the ins and outs of Processors and Motherboards for Flight Simulation.

No matter what promises you make to yourself (or whoever else holds the purse strings) the time will come when the dreaded word 'upgrade' starts to appear in your everyday conversation. It's fair to say that although there are a myriad of possible system configurations to choose from, most of them will use either an Intel or Athlon processor. Flight simulation programs, by their nature, are likely to give processors a good run for their money, so if you're buying a new PC or upgrading your existing machine, which processor is likely to perform best? There's plenty of information in the traditional hardware magazines and your local supplier will no doubt amaze you with the number of MFLOPS (more about these later) that can be performed by the device he's about to recommend ("It is a little expensive, sir, but worth it in the long run..."). However, when you're in a Sopwith Camel, spinning towards the ground, with bullets slicing through the fabric and the clatter of a Spandau ringing in your ears, or landing a 747 on two engines in fog and heavy winds, which processor is likely to be the most help? We decided to find out by letting the two main contenders fight it out.....

Let's pretend for a moment that Intel and AMD are allies rather than rivals, never feud, and have no desire to out-process each other.

Overall, this is a boon to consumers because over time, prices decline while CPU (central processing unit) speeds and enhancements increase. Perhaps the frustration and confusion that we as simmers experience is also a by-product of this jousting between the giants. So what hardware platform does one opt for? This is a question that may keep you awake at nights and one we attempt to answer as an aid to restful sleep.

SOME CPU THEORY

It's no secret that the processor is the dictator of the land when it comes to smooth flying and certainly deserves the utmost attention when shopping for a replacement. No doubt you are well aware that the Athlon and Pentium III Coppermine represent the current workhorses in the processor arena. For this month's hardware review, we played around with a couple of 550MHz models and ran them through a batch of flight tests. Before we get into the tests, lets take a closer look at some important aspects of current day CPUs.

Essentially a processor is a device that performs mathematical calculations, manipulates data, and makes logical comparisons. While that may not be too impressive, its ability to carry out instructions that are part of a particular program certainly is. By this, we mean that by simply changing from say, Flight Simulator 2000 to Fly!, the activities of a CPU might be completely re-arranged, all without any changes to the circuitry.

STASH THE CACHE (Pronounced Cash $ in the USA)

Pure clock speeds play the most significant role in determining the power of a processor. Usually this shows up in higher frame rates and smoother displays in flight simulations, but high Megahertz numbers don't always tell the complete story. Optimal cache amounts and speeds, core architecture, and 3D instruction codes all play vital roles in determining the final outcome. Let's take a quick look at cache memory.

CPUs today are equipped with 2 levels of very fast memory chips know as cache. Level 1 (L1)

AMD Athlon Processor

cache is on-die (also known as 'integrated', located very close to the processor core). This is the first storage area the CPU uses to read and write data to and is accessed very quickly. Level 2 (L2) cache, as logic would dictate, is the second data bank the CPU looks to for information. L2 cache may or may not be on-die, is often larger than the L1 and effects 3D performance more than L1. The location of the L2 is something you may want to be aware of, as off-die cache operates at 1/2 or slower the clock speed of the CPU. On-die functions at the same speed as the processor, dramatically speeding up data movement.

It is interesting to note that cache memory chips are much faster than our standard RAM modules and are thus more expensive. Cache amounts, locations, and speeds vary from model to model, as shown in the specs chart on page 59.

LET THE GAMES BEGIN

Entering the arena from the right, a 550MHz AMD Athlon processor, interfaced with an Asus K7M motherboard. Joe Wilcox, owner of PC Chips, in Keene, NH USA, supplied PC Pilot with this setup. Although Joe was unfamiliar with flight simulation when we first chatted, he took great interest in the tests and was seen not long afterwards ordering himself some new hardware and a copy of Flight Simulator 2000! Thanks Joe!

The physical installation of the K7M motherboard and Athlon was quick, as the standard ATX format presented us no problems. Our difficulties began the first time the system booted. The BIOS would not recognise the existence of our Samsung hard drive, nor our CD-ROM drive. We were aware of the Athlons being power hungry, so immediately swapped the 250-watt power supply for a 300-watt unit. Bingo, we now had our hard drive and CD-ROM, so things were looking good. Several reboots later we finally had Windows loaded and were ready for action.

This is a point that bears repeating. If you plan to upgrade to an Athlon, be sure your power supply is up to it. Many on-line resellers will inform you of particular cases and/or power supplies that are known to function with Athlons.

The Athlon performed like a champ through all the tests, never missing a beat. Its strong FPU (floating-point unit) and 200MHz connection to the chipset were apparent in every benchmark we threw at it. Bear in mind the Athlon transfers data from itself to the 'Irongate' chipset (on the motherboard) at 200MHz, twice the speed of our Pentium III. Now you may have noticed that clever marketing chaps use this figure ('200MHz Front Side Bus') in their ads, perhaps leading one to believe that the entire Athlon data bus, including the system memory, is at 200MHz. Like typical merchandising blokes, they fail to tell the true and complete story. The Athlon (in our hardware setup) transfers information back and forth to main memory at 100MHz, identical to our Intel counterpart. Only recently has there been released a board that boosts memory access to 133MHz, the KX133 chipset from VIA.

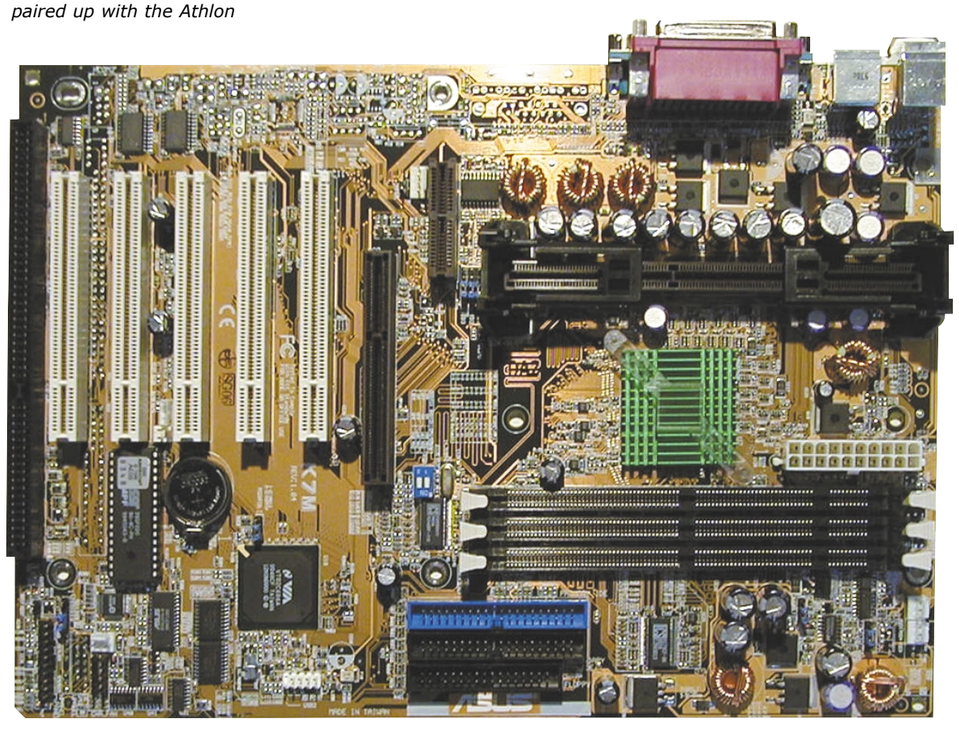
INTEL COPPERMINE PENTIUM III

At the southern entrance... from Intel, the Coppermine Pentium III, weighing in at 550MHz and mated with an Abit BH6 Motherboard. This warrior has 256kb of full speed on-die L2 cache, runs at only 1.65 volts (therefore is quite cool), and uses the familiar Slot 1 interface. This is attractive if you are currently using a Pentium II 350MHz or higher because with a BIOS update one can upgrade to Pentium III quite easily, which is what we were able to do. The system ran fine and had no power issues at all.

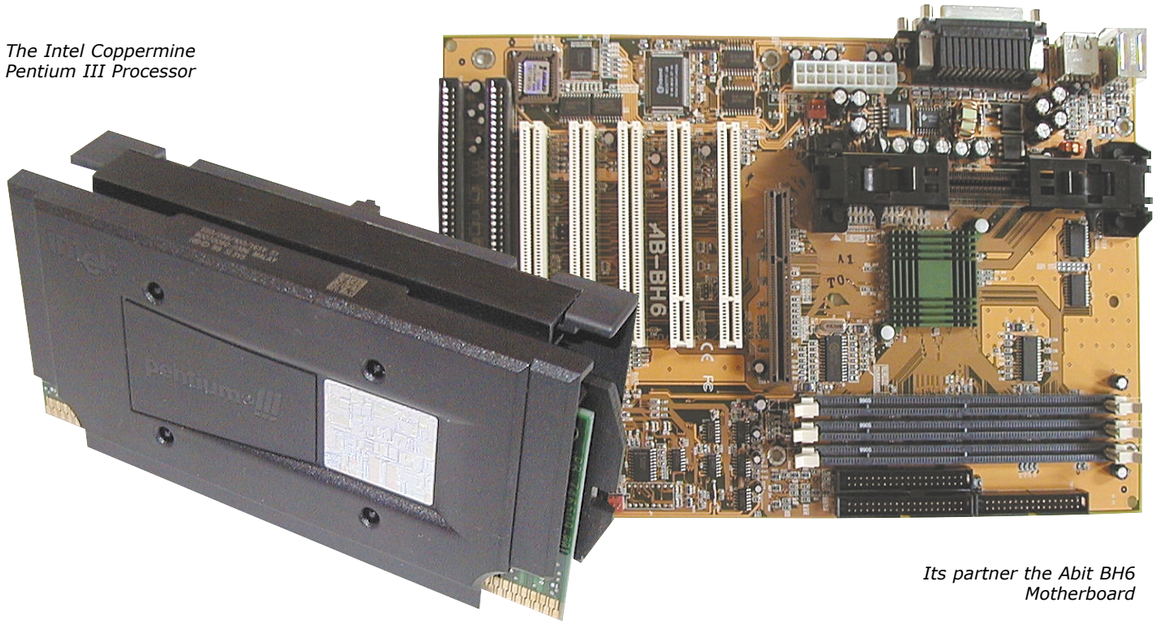
Remember that there are two versions of the Pentium III, the Katmai and the Coppermine. Katmai's are constructed on .25 micron wafers, have 512kb of L2 cache running at 1/2 the CPU speed (like the Athlon), and use the Intel's proprietary 'Slot 1' connection to the motherboard. Coppermines are available in either FC-PGA (Flip-Chip Pin Grid Array) or "Slot 1" configurations, as well as a multitude of speed combinations.

What can we say? Rock solid stability, darn good performance, fast L2 cache, and great over-clocking possibilities make this a very attractive package.

The Asus K7M Motherboard that we paired up with the Athlon



The Intel Coppermine Pentium III Processor



Its partner the Abit BH6 Motherboard

ON TO THE TESTS!

Test System: Samsung 8.4GB Hard Drive
192MB PC133 SDRAM
3dfx Voodoo3 2000 AGP Video Card
Creative Labs PCI64 Sound Card
Windows 98
Flight Simulator 2000 with latest patches installed

The flight tests were taken at 1152 X 864 resolution, 16-bit colour and various display settings (mostly we set out to see which CPU might buckle at the knees!)

We also included benchmarks from an over-clocked 366MHz Celeron and a K6-3 400 just for good measure. Six flights were conducted on Flight Simulator 2000 (used because it crunches CPUs more than any other simulation, not because we have a thing going with Microsoft).

Flight Simulator 2000 Test Flight Comparison

	Athlon	Coppermine PIII	Celeron 366@ 550MHz	K6-3 400
Meigs	25.6	23.6	21.3	14.3
London	16.35	14.5	13.7	8.25
Mountain	22.77	21.44	20.35	13.27
Nasty	20.43	18.78	17.93	11.30
Ultimate	12.52	11.62	10.38	7.34
Highest	102.16	99.2	94.7	65.8

All tests performed three times, then averaged. Figures shown are frames per second.

The AMD Athlon was the obvious winner, but noteworthy (and surprising) was the over-clocked Celeron, running only slightly behind the PIII. Considering the cost difference between the two, the 366 Celeron is a fantastic chip if, repeat if, you are able and willing to overclock.

The K6-3 is dismally far behind the pack, due to its poor core design.

MORE SCORES

While we normally don't place much value on synthetic benchmarks, SiSoft's Sandra 2000 does offer a few system tests that can reflect the outcome within Flight Simulator 2000.

The Memory benchmark measures the bandwidth of your memory subsystem: the CPU, chipset, and RAM chips. This measurement is very important and perhaps is the best synthetic benchmark we can use to speculate how a particular processor will perform with Flight Simulator 2000. Measured in megabytes per second, the Athlon just destroys the Coppermine here.

MIPS=Millions Instructions per Second

MFLOPS=Millions Floating Operations per Second

The CPU benchmark measures your processor and its internal cache performance.

FPU (floating point unit) - the special circuitry in a more general microprocessor that manipulates numbers more quickly than the basic microprocessor your computer uses. It does so by having a special set of instructions that focus entirely on large mathematical operations needed for special applications such as graphic image processing or display.

SiSoft Sandra 2000

	Athlon	Coppermine PIII	Celeron 366@ 550MHz	K6-3 400
CPU benchmark	1735 MIPS	1489 MIPS	1489 MIPS	1047 MIPS
FPU	746 MFLOPS	740 MFLOPS	739 MFLOPS	538 MFLOPS
Memory CPU	379 Mb/S	255 Mb/S	S255 Mb/S	141 Mb/S
FPU	424 Mb/S	278 Mb/S	275 Mb/S	142 Mb/S

GETTING ADVENTUROUS

Finally let's take brief look at over-clocking the Athlon and PIII. We should point out that unless you know exactly what you're doing and are prepared to risk the damage that could result, over-clocking should not be attempted. That said, our experts had no success at all bumping the Athlon's bus speed up with the mainboard's BIOS. The system crashed instantly each time we booted.

This is where the Coppermine's low heat/voltage and L2 cache configuration came shining through. The Abit board's BIOS allowed us to crank up the bus speed to 133MHz, effectively raising the CPU to 733MHz (133 X 5.5), which the chip had no problem with whatsoever. We ran the full batch of Sandra tests and flight tests, never hearing one complaint from the system. Here's the result:

Over-clocked Pentium III (733MHz)

Meigs		29.45
London		19.54
Mountain		23.35
Nasty		22.58
Ultimate		13.73
Highest		107.80
Sandra CPU Test	**CPU**	1989 MIPS
	FPU	942 MFLOPS
Sandra Memory Test	**CPU**	346 Mb/S
	FPU	372 Mb/S

SPECS AND PRICES

	Athlon	Coppermine P III	Celeron 366	K6-3 400
L1 Cache	128kb	32kb	32kb	64kb
L2 Cache	512kb	256kb	128kb	256kb
L2 Cache Speed	CPU	Full	Full	Full
Current Retail	£112.00	£160.00	£50.00	£60.00

PC PILOT RATINGS

	AMD Athlon	Pentium III Coppermine
Performance	5	4
Price	5	3
Installation	3	5
Over-clocking	2	5
Overall	5	4

CONCLUSION

So, if you're buying a new PC or taking an even greater leap of faith and upgrading your current system, which processor will cut the mustard with a taxing flight sim program?

Without a doubt, clock speeds being equal, the Athlon kicks the Pentium III pretty well. That might not apply if you're an over-clocker, however, with Intel's chip being very tolerant of higher bus speeds. Still, our gold medal goes to the Athlon, given the overall balanced nature of what it provides to the end user.

Greg Gott

VA'S ALL OVER THE PLACE!

Our search goes on for interesting virtual airlines.
In this issue we feature a VA that prides itself on training.

An Introduction to Cardinal Airlines:

Virtual Cardinal Airlines has been established with the sole purpose of providing a virtual airline for pilots wishing to rub shoulders with fellow flyers who stand just a little taller than most in the virtual flying world. If you are a novice, you will be trained by virtual and real world pilots who themselves have several thousand hours in their logbooks. You will be directed through basic training and before you know it you will be a Flight Officer flying turboprops to well known destinations throughout Cardinal's growing route system.

If you are an experienced pilot, you will feel confident with Cardinal's attractively designed and engineered aircraft and enjoy flying them over their commuter and long haul routes. If you have a current recreation or private pilot's certification, you may log your actual, real-life flights with Cardinal - a first in virtual airlines.

There are a few basic requirements for becoming a Cardinal Airlines pilot. First, you must have a genuine interest in virtual and real world aviation. Second, you must have a desire to improve your skills as a virtual aviation pilot. Third, you must be willing to spend a few hours each month involved in flying with Cardinal and having fun while doing it! Lastly, you must have Microsoft Flight Simulator.

As you fly and log hours you will work your way through the ranks by completion of written tests and flight checks. Using our special online interface, you can view other pilot's flight reports (PIREPs) to see where the action is and what the airline is doing as a whole. Soon, you will achieve 1,000 hours in your logbook and the ultimate rank of Senior Command Captain.

In addition to flying scheduled routes, Cardinal will organise Squawkbox events (see next section), that are as close to real world flying as you can get in the virtual world. Through the use of the Simulated Air Traffic Control Organisation (SATCO) you will file a flight plan and then communicate with an aircraft controller who will issue commands exactly as though you were flying under the real Air Traffic Control system. If you have never participated in online flying, it may seem a little daunting at first. However, this is a part of Cardinal's training program and with their detailed instructions as well as one-on-one guidance, you will be enjoying the ultimate virtual flying experience in no time at all.

Cardinal Airlines claims it is not an autocratic organisation - it belongs to its pilots. They have officers and a board of directors who are considerate of simmers' needs and who are ready and willing to review and implement all ideas that will contribute to the growth and improvement of the airline. ■

Mike Hambly

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MORE VA'S AROUND THE GLOBE

TEXAS AIR CARGO
Texas Air Cargo operates out of the new Austin/ Bergstrom International Airport at Austin, Texas.
WEB: http://www.geocities.com/texas_air_cargo/

VIRTUAL BRITISH CALEDONIAN AIRWAYS
VBCA is a virtual airline that is targeted towards the UK and European flight simmer.
WEB: http://avsim.com/hangar/air/vbca/index.html

POLAR AIR VIRTUAL AIRLINE. POLAR AIRWAYS
Hub.Air based at Amsterdam Schiphol Airport (EHAM) and offices in Almere The Netherlands.
WEB: http://www.polarairways.com/

VIRTUAL DELTA AIRLINES
This site is primarily for the aviation enthusiast interested in airline operations, especially Delta airlines.
WEB: http://virtualdelta.cjb.net/

AIR JET UK
This airline offers you a gateway to Virtual Airline flying.
WEB: http://www.flightsimnetwork.com/airjet/

EASYJET
Based at London Luton airport in the UK, and has over 15 destinations to fly to.
WEB: http://www.geocities.com/easyjet_va

EXCEL AIR
Serving Milwaukee, Daytona, San Diego, Denver, Dallas/ Ft. Worth, Los Angeles, Atlanta, Boston, Washington DC (DCA), Minneapolis St. Paul, and Phoenix.
WEB: http://ourworld.cs.com/FlyExcelAir

VIRTUAL 2000
Currently they fly to over than 90 destinations in Europe. UK-based.
WEB: http://va2000.homepage.com/

UK FLY
A new VA set-up to run throughout Europe and across the world.
WEB: http://www.avsim.com/

SOUTH EASTERN AIRLINES
Opened on 14 March 1999 and is based out of Hartsfield International Airport in Atlanta, Georgia.
WEB: http://free.prohosting.com/~se-air/

ICELAND AIR
They fly to most of the major airports on the US East Coast, Canada, and Europe using real world routes, time tables and of course the correct fleet of aircraft.
WEB: http://icelandair.tripod.com/

ALASKA VIRTUAL AIRLINES
Based on the real world airline, Alaska Virtual Airlines and Horizon Virtual Airlines have one of the most realistic flight schedules found on the Internet utilising comprehensive flight schedules.
WEB: http://alaska_va.tripod.com/

AIR LINGUS
This airline is based on the real Air Lingus airline. A must for Irish VA participants.
WEB: http://aer-avensis.hypermart.net/main.htm

VIRTUAL AIR COMMAND
Models itself on the real world US Air Force Air mobility Command. Here you can fly all the big USAF heavies.
WEB: http://www.geocities.com/CapeCanaveral/Campus/6174/

AIRKENT UK
AirKent is a VA from London. Currently operating the Airbus A320 family and BAe 146's from its main hub, Gatwick South Terminal. Directly linked to London via the Gatwick Express.
WEB: http://www.airkentuk.co.uk/

VIRGIN SUN
Based at Birmingham International Airport, they operate from there as well as from London-Gatwick. They operate on flights to and from sunspots around the Globe.
WEB: http://members.aol.com/Afre63456/vvs/

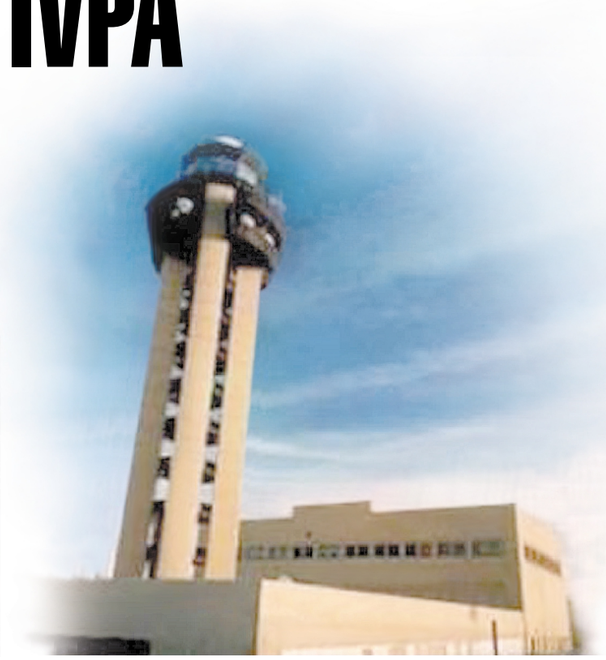
SUN CHARTER INTERNATIONAL
This is a new airline operating from the merger between BAC and SLI, within the UK to European resorts and across the Atlantic.
WEB: http://sun_leisure.homestead.com/index.html

MANCHESTER AIRWAYS VA
Manchester Airways is one of the UK's newest generation of Virtual Airlines. With its extensive UK network operating out of Ringway (Manchester).
WEB: http://www.wayne11.freeserve.co.uk/man/man.htm

60th HELICOPTER SUPPORT UNIT
A military style outfit that flies choppers in combat roles.
WEB: http://www.geocities.com/60thvaw/60thhsu/index.html

If you have a virtual airline that is not listed here, the please feel free to send in a short description to mail@pcpilot.net where we will endeavour to include it in a future issue.

Online Flying with SATCO & IVPA



SquawkBox 2.1.2 main window (top) and its FMS display

You are sitting in your 737 at Heathrow, after completing your pre-flight checks, filing your IFR flight plan to Paris and waiting for your clearance. After a slight crackle in the headset, you hear, "Speedbird three four Romeo cleared to Paris Charles De Gaulle Airport via the Pole Hill Departure, then as filed. Maintain one two thousand, expect Flight Level two zero zero ten minutes after departure. Turn right heading one six zero for radar vectors. Contact Departure on 118.5. Squawk two zero two one."

Fantasy? No, you are logged on to the Internet using SquawkBox on the SATCO network of world-wide servers, SATNET, where you get real-time, live ATC from controllers using ProController, as well as real weather from the NOAA hourly METAR reports. You no longer have to fly alone, or endure the chaos of Mach 3 Cessnas in uncontrolled and unstructured multi-player sites.

Virtual pilots with an interest in realism can now experience an environment very similar to real world flight by using the free clients, SquawkBox or ProController, and a free membership in SATCO, the Simulated Air Traffic Controllers Organisation (http://www.satco.org), or IVPA, the International Virtual Pilots Association (http://www.ivpa.com) .

Communications are handled by text, using SquawkBox or ProController, as well as by voice using Roger Wilco, a free add-on from Resounding Technology, (http://www.resounding.com).

Many real-life air traffic controllers, as well as commercial and private pilots, are members and there are numerous tutorials and lessons on flight and controlling available through SATCO, IVPA, the VTA (the Virtual Training Academy, http://www.ivpa.com/vta) and the SATCO Divisions around the world.

SATCO and IVPA offer to simulator pilots and controllers the opportunity to make the simulator experience as real as you want it.

SquawkBox is currently available for Microsoft Flight Simulator 95, 98 and 2000, as well as Aerowinx's 747-400 Precision Simulator v1.3. Joe Jurecka, author of SquawkBox, who expects to release SquawkBox v2.2 in the near future, plans support for other multi-player capable simulators.

ProController, by Jason Grooms is the client for ATC and gives the virtual controller a radar screen very similar to those used in real world air traffic control.

Both SquawkBox and ProController are free and more information as well as technical support is available on their web site at http://www.avsim.com/mike/sb_pc/ .

In order to join in the online fun, visit either the SATCO HQ or IVPA web site and register for your ID and password. In a short time you will be able to join the other 23,000 plus SATCO/IVPA members in the world of online flight and ATC. ■

Ray F. Jones

Modem Busters

Our essential guide to downloads

By Joe Lavery

We're making it a regular job to seek out the best in free software available on the Internet and this is the latest crop. Always check the 'Readme' files and for a gentle introduction to the art of downloads, check out the feature in Issue 3. Good luck, and if you find a free gem in your online travels that you think other readers might enjoy, then let us know by dropping us a line at mail@pcpilot.net

Panels for Flight Simulator 2000

B744 deluxe Panel v3.0 for Flight Simulator 2000

This is a high quality photo-realistic panel that features switchable MFD's (Multi function Displays), with internal views using the FPDA pushback facility. It also has an auto co-ordinator, seatbelt/no smoking signs and supports the Flight Simulator 2000 GPS. You can, if you prefer, configure the panel to include Alain Capt's GPS98-ver3. The panel uses the real CRT gauges that have to be registered for use.

By: John J. Schumacher
Download from: www.flightsim.com
Filename: 744dlx3.zip

Boeing 717 - Version 5.1f

This freeware panel includes, engine Startup and Shutdown, and Avionics ON/OFF systems. The throttle quadrant is fully operational with all moving parts, which are mouse controllable. Also with switchable MFD's, a working Fire system, Internal cockpit views and incorporating the Flight Simulator 2000 GPS, The panel comes with interactive checklists and an extensive manual.

The zip also contains a B-717 Aircraft with authentic handling to get you started.

By: Roy Chaffin.
Download from: www.flightsim.com
Filename: rc71752s.zip

Baron High Resolution IFR panel Elite style (Version 1.0)

If you can't afford to buy the Elite IFR flight simulator featured in the last issue, have a look at a respectable alternative from Edouard Halbert. The panel is usable for all twin piston-engined aircraft, but designed with the Beechcraft Baron 58 in mind. To make the Baron complete you'll also need to download an aircraft. The author recommends the Baron made by Michael Verlin. (B58_2K.ZIP at www.flightsim.com.)

By: Edouard Halbert
Download from: www.simviation.com
Filename: ifr-baron.zip

Flight Simulator 98 Aircraft

B777-200 32 Sided Fuselage V.2

One of a new series of aircraft from Sandro Bernardini that feature round fuselage and engine housings made using 32 segments. The model has many other animated 3D components, the landing gear is steerable and the engines have rotating fan blades. Finally the spoilers, flaps and ailerons work just like the real thing.

By: Sandro Bernardini
Download from: www.flightsim.com
Filename; 777s98v2.zip

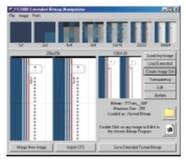
Dehavilland DASH8-100

This is a beautifully designed aircraft with maximum moving parts and steerable nose wheel.

By: Barry Blaisdell with flight dynamics by Jens Borgstroem
Download from: www.avsim.com
Filename: dh81norn.zip

Utilities

Flight Simulator 2000 Extended-Bitmap Editing Utility



This utility allows you to edit Extended-Format Bitmaps like those found in Combat Flight Simulator and Flight Simulator 2000. You can use your favourite Paint Program for the actual editing and the program supports all Flight Simulator 2000 bitmap types encompassing 8/16/32 bit.

By: Martin Wright
Download from: www.simviation.com
Filename: bmp2000.zip

Flight Adventures

Flight Simulator 2000-Pro MV challenge - Tropical Solomon Islands.

In this adventure by Michael Vone you have to pilot a King Air around the Solomon Islands, making three intermediate landings at small airstrips, starting from the island of Guadalcanal. The trip kit includes Flight Simulator 2000 startup flights at each airport, a flight plan and route map. No other add-ons are needed.

By: Michael Vone
Download from: www.avsim.com
Filename: mvsolisl.zip

F2H-2 Banshee Mission pack - for Combat Flight Simulator

We don't see that many new freeware mission packs for Combat Flight Simulator and this one is particularly well produced. Here you fly the F2H-2 Banshee Navy Fighter against the MiG 15 & Yak 9. There are 12 missions in all, with the Aircraft, Carrier Group & all necessary files included. The missions are flown using the default Combat Flight Simulator scenery.

By: Doug Attrell & Mike Eustace.
Download from: www.simviation.com/fsdcfsmission.htm
Filename: F2H2Mispak.zip

Flight Simulator 2000 Aircraft

British Airways CRJ-200LR

Bill Alderson and Tony Madge have done a superb job on this regional jet, both in terms of its looks and handling. The aircraft incorporates animated flaps, gear, spoilers and rotating engine fans. It has a transparent cockpit and vapour trails. The outstanding photo-realistic textures and animated parts are by Tony Madge.

By: Bill Alderson
Download from: www.avsim.com
Filename: tmbacrj.zip

Air Greece Fokker 100

One of Olympic Airways prime competitor in the Hellenic commercial aviation market. From a Kim Simmelink original. Moving Flaps & Gear. Textures (incl. Greek name)

By: Spyros Diamantis and Kyprianos Biris
Download from: www.avsim.com
Filename: mvsolisl.zip

Boeing B727-200 Caesar-Air Europe

The quality of the paintjob on this 727 just has to be seen, it stands head and shoulders above anything that is commercially available. In addition, the aircraft sports fully moving slats and Krueger flaps, has a transparent windscreen, incorporates 12-sided fuselage construction and engine cowlings.

By: E. Diaz
Download from: http://home.sol.no/~jonwold/fs2k/727.htm
Filename: cse_7272.zip

Transocean Air Lines Boeing Stratocruiser

This is an update of the aircraft released April 23, 2000. It is now textured for night lighting. Windows are illuminated, and you have the option to light up the rudder, or not. The author has set the default to be full illumination, not historically accurate... but snazzy anyway.

By: Dave McQueen
Download from: http://home.sol.no/~jonwold/fs2k/index.htm
Filename: b377tafsn.zip

Grumman F-14 Tomcat

Fly the Big Cat courtesy of Dino Cattaneo and friends. The aircraft has working variable geometry wings, arrester hook, fully animated control surfaces and a well designed cockpit panel with new gauges. The package comes with a full set of engine sounds.

By: Dino Cattaneo and friends
Download from: http://home.sol.no/~jonwold/fs2k/tomcat.htm
Filename: f14aj200.zip

Kaman HH-43B Huskie

This aircraft was originally used as a rescue and fire fighting aircraft, carrying foam fire suppressant in a pod beneath the fuselage. It used a combination of the foam and the downwash from the rotor blades to put out any fires. It would also hover over trapped personnel, using the same method to keep the flames at bay.

By: David Eckert
Download from: http://www.simviation.com
Filename: hh43b.zip

Piper PA-28R-201T Cherokee Arrow III turbo

An update to the original Arrow model released in 1998, now fully Flight Simulator 2000 compatible with full moving parts as a result of Aircraft Animator 1.2. It also has, thanks to Ron Freimuth, a smoother, better behaved

mixture control. The package also includes a suitable control panel.

By: Michael Verlin
Download from: www.flightsim.com
Filename: pa28r_2k.zip

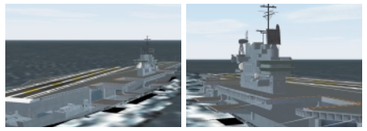
Scenery Areas

Cannes Mandelieu Airport

High quality rendition of Cannes airport on the French Riviera.

By: Eric Turpin
Download from: http://home.sol.no/~jonwold/fs2k/scenery.htm
Filename: lfmd2000.zip

U.S.S. Saratoga CV60 Version: 1.0



A far superior Aircraft Carrier to the one included with Flight Simulator 2000. The ship was designed by hand using only the SCASM 2.39 from Manfred Moldenhauer. It has a full functional deck with moving parts including radar, raising blast barriers etc. It was modelled at a resolution of 10 pixels per metre.

By: Robert Waszkiewicz
Download from: www.flightsim.com
Filename: cv602v10.zip

London Stansted Airport UK

John Young has created a replacement for the default London Stansted scenery with new terminals, tower, FLS maintenance centre and cargo building. It includes 22 numbered gates and additional stands plus signage, trees, car parks and road lighting. To complete the illusion, there are also 10 representative static aircraft types.

By: John Young.
Download from: www.flightsim.com
Filename: egssjy.zip

Product Listings

Comprehensive round-up of the most popular products, as listed by RC Simulations in Bristol.

We've also included a rough compatibility guide of add-ons that may or may not work with Flight Simulator 2000 too. Where listed as 'FS2000' this means the products are designed and adapted to run with Flight Simulator 2000 without any problems or bugs. Where 'Partial' compatibility is listed, this means that only some of the product may work or bugs or unacceptable glitches may appear in some or most of the product. As always, if in doubt check with the supplier or publisher before purchase to clarify any concerns.

JOYSTICKS AND THROTTLES

Product	Manufacturer		Price (RRP)
CH Flightstick PC	Virtual Reality		£29.95
CH Mach 1 Joystick PC	Virtual Reality		£19.95
CH Mach 1 Plus Joystick PC	Virtual Reality		£24.95
CH Mach 3 Joystick PC	Virtual Reality		£29.95
CH Jetstick PC	Virtual Reality		£19.95
CH Gamestick PC Analogue	Virtual Reality		£34.95
CH Gamestick 3D USB	Virtual Reality		£59.95
CH F16 Flight Stick PC	Virtual Reality		£24.95
CH F16 Combat Stick PC	Virtual Reality		£76.95
CH F16 Fighter Stick PC	Virtual Reality		£119.95
CH F16 Fighter Stick USB	Virtual Reality	Due Autumn 2000	£TBA
CH USB F16 Combatstick	Virtual Reality		£99.95
CH Pro Throttle USB	Virtual Reality	Due Autumn 2000	£TBA
CH Pro Throttle PC	Virtual Reality		£119.95
CH Gamepad USB (Clear or Black)	Virtual Reality		£36.95
CH Joystick Switchbox PC	Virtual Reality		£32.95
CH Gamecard GC3 (PC)	Virtual Reality		£34.95
CH Trackball Pro (PS2 or Serial)	Virtual Reality		£89.95
CH X Cable (PC Extension Cable)	Virtual Reality		£11.95
CH EXL500 Race System	Virtual Reality		£71.95
Cyborg 2000 Joystick	Saitek		£39.99
Cyborg 3D Stick	Saitek		£49.95
Cyborg 3D Stick USB PC	Saitek		£49.99

PEDALS

Product	Manufacturer		Price (RRP)
CH Pro Rudder Pedals PC	Virtual Reality		£99.95
CH Pedals	Virtual Reality		£53.95
CH Pro Rudders USB	Virtual Reality		£99.95
CH Pedals USB	Virtual Reality	Due Autumn 2000	TBA
MRVC Rudder Pedals	RC Simulations		£119.95
Cirrus Rudder Pedal Set PC	Precision Flight Controls		£399.95

STANDALONE SIMULATIONS

Developer	Publisher/Distributor	Product	Price (RRP)	PC Pilot Rating
TRI	Take Two	Fly!	£34.95	3
Looking Glass	Electronic Arts	Flight Unlimited 3	£34.95	4
Wilco	Just Flight	Hangsim	£29.95	4
BAO	Apollo	Tower Controller	£44.95	
Laminar Research		Xplane	£99.95	
Digital Aviation		Light Aircraft Simulator 6	TBA	Due Summer 2000
Oddsoft		Rant 2000	£89.95	
PC Aviator		ATC 2000	£59.95	Due Summer 2000
Nomissoft	Just Flight	Airline Simulator 2	£99.95	3

COMBAT FLIGHT SIMULATOR ADD-ONS

Developer	Publisher/Distributor	Product	Price (RRP)	PC Pilot Rating
Just Flight	Just Flight	Pacific Combat Pilot	£24.95	4
FSD	Just Flight	The Luftwaffe Collection	£24.99	5
FSD	Just Flight	Combat Pilot No.1 (Attack) Sqd.	£19.99	4
Just Flight	Just Flight	Combat Aces	£TBA	
Abacus	Contact Sales	3 Great Planes Gold Box	£14.95	2
Just Flight	Just Flight	Aces High	£24.99	3
Abacus	Contact Sales	Pacific Theatre Aircraft	£29.99	4
Abacus	Contact Sales	Wings Over China	£27.95	3
Abacus	Contact Sales	Tuskegee Fighters	£29.95	5
Data Becker	RC Simulations	Stuka	£9.95	
Mailsoft	RC Simulations	Swiss Military 2000	£29.95	

We're on the web at www.rcsimulations.com

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Email: sales@rcsimulations.com

The Product Listings section is kindly sponsored by RC Simulations, the UK's leading supplier of flight simulation equipment and software.

RC are one of the oldest established flight sim companies and offer a friendly, expert service.

They are able to supply any of the products listed here to anywhere in the world – often at a discount to the price seen above. So if you are looking for the latest release or a hard-to-find piece of hardware, give them a call!

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NAME

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FLIGHT SIMULATOR ADD-ONS

Developer	Publisher/Distributor	Product	SIMULATOR COMPATIBILITY	Price (RRP)	PC Pilot Rating
Abacus	Contact Sales	3 Great Planes Gold Box (F4U-5 Corsair, P-51 Dakota Kid Mustang, Spitfire)	FS2000	£14.95	2
Abacus	Contact Sales	3 Great Planes Blue Box (Cessna Caravan, DHC-6 Twin Otter, Piper Cherokee)	FS2000	£14.95	2
Abacus	Contact Sales	Private Pilot	FS2000	£27.95	
Abacus	Contact Sales	Flight Deck Blue Angels	FS2000	£29.99	3
Abacus	Contact Sales	Dangerous Airports	FS2000	£29.99	3
Abacus	Contact Sales	Airport & Scenery Designer V2	FS2000	£34.99	4
Abacus	Contact Sales	Co Pilot 2.1	FS2000	£34.99	3
Abacus	Contact Sales	Aircraft Factory 99	FS2000	£34.99	4
Abacus	Contact Sales	Instant Airplane Maker	FS2000	£29.99	4
Abacus	Contact Sales	Custom Panel Designer	FS2000	£27.95	3
Abacus	Contact Sales	Aircraft animator	FS2000	£27.95	4
Abacus	Contact Sales	FS flightbag	FS2000	£19.99	3
Aerosoft	RC Simulations	Berlin 2000	FS2000	£22.95	
Aerosoft	Aerosoft	German Airports 1	FS2000	£29.95	
Aerosoft	Aerosoft	German Airports 2	FS2000	£29.95	
Aerosoft	RC Simulations	German Airports 3	FS2000	£26.95	4
AETI	RC Simulations	AETI 737 Aircraft & Panel	Generally Compliant	£14.99	2
AETI	RC Simulations	The Next Generation Aircraft	FS98	£14.99	3
AETI	RC Simulations	AETI MD-83 Aircraft & Panel	Generally Compliant	£24.99	3
AETI	Just Flight	Proflight 2000	FS2000	£34.99	
AETI	RC Simulations	The Jet Age	FS98	£19.99	2
Apollo	Just Flight	Europe 1 Pro	Generally Compliant	£34.99	4
Apollo	Just Flight	Europe 3 for FS98 (England & Wales)	Generally Compliant	£29.99	3
Apollo	RC Simulations	Europe 2000	FS2000	TBA	
Apollo	RC Simulations	Adventure 2000	FS98	£39.99	
Wilco	Just Flight	Grand Canyon Scenery	Generally Compliant	£24.99	4
Lago	Just Flight	Japanese Aircraft Collection	Generally Compliant	£9.99	3
Lago	Just Flight	FS Traffic	FS2000	£19.99	5
Just Flight	Just Flight	Himalayas Scenery:	Generally Compliant	£9.99	3
Just Flight	Just Flight	Sri Lanka Scenery	Generally Compliant	£9.99	2
Just Flight	Just Flight	Royal Air Force 2000	FS2000	£24.95	4
Just Flight	Just Flight	Precison Pilot	Various	£34.99	
Just Flight	Just Flight	Final Approach 2000	FS2000	£29.95	
Wilco	Just Flight	Airport 2000 Volume 1	FS2000	£29.99	4
Just Flight	Just Flight	Airport 2000 Volume 2	FS2000	£29.95	
Just Flight	Just Flight	Australia Scenery	Generally Compliant	£19.99	2
Just Flight	Just Flight	Scenery Venice	Generally Compliant	£9.99	3
Flight One	Just Flight	747-400 Jumbo	FS2000	£19.99	3
Just Flight	Just Flight	Scenery Vienna	Generally Compliant	£9.99	3
Flight One	Just Flight	FS Clouds & Textures Pro 2000	FS2000	£29.99	4
Flight One	Just Flight	Flight Director'99 V2	FS2000	£29.99	4
Flight One	Just Flight	Flight Director 2000	FS2000 Due June 2000	£29.99	
Flight One	Just Flight	Legendary Aircraft 2000	FS2000	£24.95	4
VIP	Just Flight	VIP Classic Airliners	FS2000	£24.99	2
Pilots	Just Flight	Tupulov TU-154	Generally Compliant	£19.99	2
Flight One	Just Flight	FS Weather Plus	FS98	£19.90	3
Pilots	Just Flight	Airbus 2000	FS2000	£24.99	3
Just Flight	Just Flight	Concorde SST	Generally Compliant	£24.99	4
VIP	Just Flight	VIP Ultimate Classic Wings	Generally Compliant	£29.99	4
VIP	Just Flight	VIP Classic Wings 98	Generally Compliant	£19.99	4
Aerosoft	Just Flight	Airline Flights (Airline Adventures)	FS98	£9.99	2
Aerosoft	Just Flight	Airline Flights 2	FS2000	£29.99	2
Data Becker	Data Becker	Special Air Mission	FS98	£19.99	2
Data Becker	Data Becker	747	FS98	£19.99	2
FlightSoft	RC Simulations	Tribute to the DC-10 (Due October 2000)	FS2000	TBA	
Just Flight	Just Flight	Great Britain & Ireland (Due September)	FS2000	£24.99	3
Instant Access	Just Flight	Hong Kong'99	Generally Compliant	£19.99	3
Mailsoft	RC Simulations	Balaeric Islands Scenery	Generally Compliant	£29.95	2
Mailsoft	RC Simulations	Hungary, Slovikia and Czech Republic	Generally Compliant	£29.95	3
Mailsoft	RC Simulations	Scandinavia	Generally Compliant	£29.95	3
Mailsoft	RC Simulations	Turkey & Cyprus	Generally Compliant	£29.95	2
Mailsoft	RC Simulations	Airport Zurich-Kloten	Generally Compliant	£29.95	
Mailsoft	RC Simulations	Greece Scenery	Generally Compliant	£29.95	2
Microsoft	Microsoft	Microsoft Combat Simulator	Complete Sim	£39.99	4
Microsoft	Microsoft	Microsoft FS2000 (Standard)	Complete Sim	£49.95	4
Microsoft	Microsoft	Microsoft FS2000 (Professional)	Complete Sim	£69.95	4
Papa Tango	Papa Tango	Austria Pro	FS2000	£27.95	4
Lago	Papa Tango	The Triangle	FS98	£34.99	4
Papa Tango	Papa Tango	Flight Academy'98	Generally Compliant	£34.99	3
Papa Tango	Papa Tango	Fly Lauda	FS2000	£34.95	2
PC Aviator	RC Simulations	Megascenery Downunder	Generally Compliant	£39.95	3
PC Aviator	RC Simulations	Pacific Northwest Megascenery	Generally Compliant	£39.95	3
Take 2	Take 2	Mayday! Mayday!	FS98	£24.99	2
Technic Direct	RC Simulations	HQ Aircraft Collection 2	Generally Compliant	£29.99	3

FLIGHT YOKES

Manufacturer	Distributor	Price (RRP)
CH USB Flight SimYoke (Three Levers)	Virtual Reality Due Summer 2000	£129.95
CH USB Flight SimYoke LE (One Lever)	Virtual Reality	£109.95
CH Flight Sim Yoke PC (One Lever)	Virtual Reality	£89.95
AETI ACFSII Yoke & Throttle	RC Simulations	£399.95

CONTROL PANELS & COCKPIT SYSTEMS

Manufacturer	Distributor	Price (RRP)
ACP Panel Compact	RC Simulations	£199.95
Optivision Visual Display System	RC Simulations	From £2999.95
Copy Cat Helicopter Multi-Role Virtual Controls (MRVS)	RC Simulations	£549.95
Copycat Controls (Aircraft Style)	RC Simulations	£1,999.95
Pro Quality Fresnel Lense & Fittings	RC Simulations	£99.95

Glossary

The world of aviation seems blessed with a bewildering array of acronyms. We hope the following will prove a handy reference guide to some of the more widely used terms.

A

ACARS - Aircraft Communication Addressing and Reporting System
ADF - Automatic Direction Finder/Finding
ADI - Attitude Deviation Indicator
ADR - Accident Data Recorder
AFCS - Automatic Flight Control System (an advanced autopilot)
AFIS - Aerodrome Flight Information Service
AGL - Above Ground Level
AHRS - Attitude-Heading Reference System
AIS - Aeronautical Information Service. CAA unit based at London-Heathrow Airport, providing flight-planning services and information for pilots
AIZ - Aerodrome Information Zone
AOPA - Aircraft Owners and Pilots Association
A/P - Airport or Autopilot
APP - Approach (control)
APU - Auxiliary Power Unit
ASI - Airspeed Indicator
ASR - Altimeter Setting Region
ATC - Air Traffic Control
ATIS - Automatic Terminal Information Service

B

BRG - Bearing

C

CAA - Civil Aviation Authority – the UK aviation regulatory organisation
CAS - Calibrated Airspeed
CAT - Clear-Air Turbulence
CDI - Course Deviation Indicator
CDU - Control Display Unit
CH - Compass Heading
CHT - Cylinder Head Temperature (a cockpit gauge)
C/L - Centre-Line (of a runway, for example)
Clouds - commonly-used abbreviations for cloud types:-
* AC - altocumulus
* AS - altostratus
* CB - cumulonimbus
* CC - cirrocumulus
* CI - cirrus
* CS - cirrostratus
* CU - cumulus
* NS - nimbo stratus
* SC - stratocumulus
* ST - stratus

CRT - Cathode Ray Tube (television monitor)
CRS - Course
CSU - Constant-Speed Unit
CTA - Control Area
CTR - Control Zone
CVR - Cockpit Voice Recorder
CZ - Control Zone (USA)

D

DF - Direction-Finding
DH - Decision Height
DI - Direction Indicator
DME - Distance-Measuring Equipment

E

EADI - Electronic Attitude Director Indicator
ECU - Environmental Control Unit
EFAS - Electronic Flash Approach Light System
EFIS - Electronic Flight Instrument System
EGT - Exhaust Gas Temperature (a cockpit gauge)
EHSI - Electronic Horizontal Situation Indicator
EICAS - Engine Indicating and Crew Alerting System
ELT - Emergency Locator Transmitter

F

FAA - Federal Aviation Administration, USA equivalent of UK CAA
FADEC - Full-Authority Digital Engine Control
FAF - Final Approach Fix
FDR - Flight Data Recorder more popularly known as the `black box'
FL - Flight Level
FMS - Flight Management System. Also referred to as FMC (Flight Management Computer)

G

GCA - Ground-Controlled Approach
GNSS - Global Navigation Satellite Systems
GPS - Global Positioning System (Navstar)
GPWS - Ground Proximity Warning System
GS - Glideslope
G/S - Groundspeed

H

HDG - Heading
HF - High-Frequency band
HSI - Horizontal Situation Indicator
HUD - Head-Up Display

I

IAS - Indicated Airspeed
ICAO - International Civil Aviation Organisation (responsible for the codes for airports amongst other things)
IFCS - Integrated Flight Control System
IFR - Instrument Flight Rules
IGS - Instrument Guidance System
ILS - Instrument Landing System
INS - Inertial Navigation System
IR - Instrument Rating
ISA - International Standard Atmosphere
ITT - Inter-Turbine Temperature

K

KHz - Kilohertz
Kt - Knot - one nautical mile per hour. One knot equals 1.1515 mph
kW - Kilowatt

L

LARS - Lower Airspace Radar Advisory Service
LAT - Latitude
LDA - Landing Distance Available
LF - Low Frequency - radio waves with frequencies in the 30-300 kHz band
LITAS - Low-Intensity Two-colour Approach System
LOC - Localiser
LON(G) - Longitude

M

M or MAG - Magnetic
Mach - Ratio of true airspeed to the speed of sound. Mach 1 = 1,100 feet per second or 760 mph
MAP - Missed Approach Point
MB - Millibar
MDA - Minimum Descent Altitude
MDH - Minimum Descent Height (above ground level)
MET - Meteorology, weather
METAR - Coded aerodrome MET report
MF - Medium Frequency
MFD - Multi-Function Display
MH - Magnetic Heading
MHz - Megahertz
MLS - Microwave Landing System
MSA - Minimum Safe Altitude
MSL - Mean Sea Level
MTOW - Maximum Take Off Weight
MZFW - Maximum Zero Fuel Weight

N

NATS - National Air Traffic Services
NDB - Non- Directional Beacon
NM - Nautical Mile
NOTAM - Notices to Airmen

O

OAT - Outside Air Temperature
OBS - Omni-Bearing Selector, used to select the radial from a VOR

P

PAPI - Precision Approach Path Indicator
PAR - Precision Approach Radar
PIC - Pilot-In-Command
PIO - Pilot-Induced Oscillation
PLN - Flight-Plan
PMS - Performance Management System
POB - Persons On Board. See also SOB
POH - Pilot's Operating Handbook, an aircraft's `owner's manual'
Pooley's - Flight guide to the United Kingdom and Ireland, published annually
PPL - Private Pilot's Licence
PTT - Press-To-Transmit

Q

QDM - Magnetic bearing to a direction-finding station
QDR - Magnetic bearing from the station
QFE - Atmospheric pressure at aerodrome elevation
QFU - Magnetic orientation of runway in use
QNE - Reading in feet on an altimeter set to 1013
QNH - Altitude above mean sea level based on local station pressure
QTE - True line of position from a direction-finding station
QUJ - True bearing

R

RAS - Radar Advisory Service
RCL - Runway Centre-Line
RBI - Relative Bearing Indicator, displaying information from the ADF
RDO - Radio
RIS - Radar Information Service
RMI - Radio Magnetic Indicator
RMU - Radio Management Unit
RVR - Runway Visual Range
RWY - Runway
RX - Receiver

S

SAS - Stability Augmentation System
SB - Service Bulletin
SELCAL - Selective Calling
SFC - Specific Fuel Consumption
SID - Standard Instrument Departure
SOB - Souls On Board (see also POB)
SOP - Standard Operating Procedure.
SR - Sunrise
SRZ - Special Rules Zone
SRA - Surveillance Radar Approach
SRE - Surveillance Radar Element of a GCA
SS - Sunset
SSB - Single Sideband
SSR - Secondary Surveillance Radar
STAR - Standard Terminal Arrival Route, for inbound IFR traffic
STOL - Short Take-Off and Landing

T

TACAN - Tactical Air Navigation System
TAF - Terminal Area Forecast
TAS - True Air Speed
TCA - Terminal Control Area (USA)
TCAS - Traffic Alert and Collision Avoidance System
THR or Thld. - Threshold
TMA - Terminal Control Area (UK)
TO - Take- Off (sometimes TKOF)
TODA - Take- Off Distance Available
TODR - Take- Off Distance Required
TORA - Take- Off Run Available
TSO - Technical Standard Order
TVOR - Terminal VOR
TWR - Tower (aerodrome control tower)
TWY - Taxiway
TX - Transmitter

U

UDF - UHF Direction Finding
UHF - Ultra-High Frequency
UIR - Upper Information Region
UTC - Co-ordinated Universal Time, (Greenwich Mean Time)

V

VAL - Visual Approach and Landing (chart)
VAR - Variation (magnetic)
VASIS - Visual Approach Slope Indicator System
VDF - Very-High Frequency Direction-Finding
VFR - Visual Flight Rules
VHF - Very H igh Frequency
VIS - Visibility
VLF - Very Low Frequency
VOLMET - Continuous recorded broadcasts of weather conditions
VOR - Very high frequency Omni-directional Range
VP - Variable-Pitch (propeller)
VRP - Visual Reporting Point
VSI - Vertical Speed Indicator

W

WP - Waypoint
WX NIL - No significant weather, term used in Met reports

X

XMSN - Transmission
XPDR - Transponder

Z

ZFW - Zero-Fuel Weight - maximum permissible weight of an aircraft
ZULU or Z - Used worldwide for times of flight operations (same as UTC)

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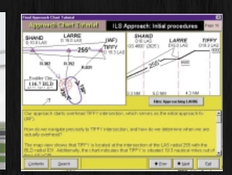

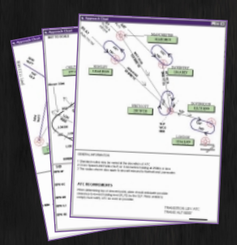

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